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WORKING AT HEIGHT ASSOCIATION
REACHING NEW LEVELS IN SAFETY

INDUSTRY CODE

FOR

PERMANENT ANCHOR SYSTEMS, LIFELINE AND RAIL INSTALLATIONS

FOR WORKING AT HEIGHT

For Public Release

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1. INDUSTRY GUIDELINES

1.0 PREFACE

The Standards Australia publication AS/NZS 5532 - Manufacturing requirements for single-point anchor devices used for harness-based work at height, prescribes the design and testing requirements for anchor points used for fall protection. In addition, AS/NZS1891.2 Industrial Fall Arrest Systems and Devices (Horizontal Lifeline and Rail Systems) provides guidelines on the safe design and manufacturing guidelines for horizontal systems and AS/NZS 1891.3 Industrial Fall Arrest Systems and Devices provides guidelines on the safe design and manufacturing guidelines for vertical systems.

Up to this time, industry has used a system of self-certification to determine the safe installation of these systems. Manufacturers have also provided guidelines. However the definitions of safe installation and adequate documentation have never before been defined in a method consistent with industry expectations.

Market demands have also called for incremental documentation to provide industry with a set of principles of installation specific for these types of applications, rather than a sole reliance on the traditional, generic *Codes of Practice* published by the Federal, State and Territory Regulators.

This Industry Code document is intended to provide that further guidance. It is intended for use by installation companies, inspection entities, end users, facility managers and building owners on the recommended best practice methodologies to ensure safe access to a system, system design, installation and inspection of both horizontal and vertical static lines as well as permanently installed anchor points.

This document has been crafted with input from Regulators, Manufacturers, Industry Associations and people with technical knowledge in the subject. It is also the outcome of a period of significant public consultation and input and we therefore commend its use by all entities with an interest or need in managing these safety systems.

1.1 SCOPE & PURPOSE

This document relates to personal fall arrest anchors, horizontal and vertical lifelines and rails that are permanently installed for use in general fall protection and rope access in workplaces, as well as the equipment used to gain access to those systems.

The document is also designed for use in conjunction with anchors complying with the manufacturing standard for anchors certified to AS/NZS 5532 fall protection equipment certified to AS/ANZ 1891 and the access/egress to the system complying with AS 1657.

Installations of other products including horizontal lifelines and rails covered under Part 2 and vertical lifelines and rails covered by Part 3 that are manufactured in conformance with AS/NZS 1891 series, plus anchor requirements identified under AS/NZS 4488 - rope access, are also covered within this document.

The Code does not represent the only acceptable means of achieving the standard to which the Code refers.

The Code provides guidance and clarification on the Work Health and Safety Regulation and should be read in conjunction with relevant WHS Codes of Practice. A full list of reference documents is shown in Appendix B.

For any working at heights situation where harnesses are involved, there needs to be suitable lifeline systems and/or a number of anchorage points provided to ensure safety for the users. This document seeks to provide guidance for installers of anchorage and lifeline installations where such systems of fall protection are often installed by a contractor, for use by an entirely different set of personnel.

In addition to the fall protection system itself, access to the location of system entry such that the workers can climb and egress from the system safely must be provided.

Each installation shall be designed, laid out, installed, commissioned, documented, inspected and logged within a specified time frame and maintained to ensure its ongoing serviceability by those using the system for their own personal safety. Detailed records of this process must also be maintained.

Whilst all care has been taken to prepare information that is factual and in alignment with all Federal, State and Territory legislative requirements, this document should not be relied on solely as a prescriptive guideline. All errors and omission are excepted.

1.2 HIERARCHY OF CONTROL

The Hierarchy of Control for fall prevention shall be followed to determine the most appropriate control measure to reduce or eliminate the risk of a fall. Anchorage based fall protection systems are dependent on a high level of user skill, and are prone to misuse. Anchor based systems are less preferable to horizontal, vertical or passive systems (eg. guardrail and platforms) and should only be considered when no suitable alternative solution can be identified. Refer to AS/NZS 1891.4 and state or federal regulator Codes of Practice for more information.

The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest as shown in Table 1. This ranking is known as the hierarchy of risk control.

The WHS Regulations require duty holders to work through this hierarchy when managing risk:

TABLE 1 - HIERARCHY OF CONTROL

Level of Protection	Control	Solution	Reliability of Control
Level 1 HIGH	Elimination	Elimination of the height safety hazard through redesign. Eliminate the need to work at height.	MOST
Level 2 MEDIUM	Substitution	Substitute the height safety hazard with something safer. e.g. Use an EWP	MIDDLE
	Isolation	Isolate the height safety hazard from people. e.g. Implement lock out systems.	
	Engineering Controls	Reduce the risk through engineering controls. e.g. Use guard rails or walkway systems.	
Level 3 LOW	Administrative Controls	Use administration systems to control access. e.g. Permit to work systems	LEAST
	Use of Personal Protective Equipment	Use of fall protection equipment (anchor systems, harnesses, shock absorbing lanyards etc.) in conjunction with safe work method statements (SWMS)	

The aim must always be to eliminate a hazard, which is the most effective control.
If this is not reasonably practicable, the risk should be minimised by working through the other alternatives in the hierarchy.

1.2.1 Level 1 Control Measures

The most effective control measure involves eliminating the hazard and associated risk. The best way to do this is by, firstly, not introducing the hazard in the workplace. For example, you can eliminate the risk of a fall from height by doing the work at ground level. The system owner should attempt to design out the hazard and, if not, work with the system designer to incorporate risk control measures that are compatible with the functional requirements.

1.2.2 Level 2 Control Measures

If it is not reasonably practicable to eliminate the hazards and associated risks, the system designer should minimise the risks using one or more of the following approaches:-

- Substitute the hazard with something safer. For instance, install permanent ladders and walkways.
- Isolate the hazard from people. For instance, install permanent ladders and walkways.
- Use engineering controls. An engineering control is a control measure that is physical in nature.

1.2.3 Level 3 Control Measures

These rely on human behaviour and supervision, and used on their own, tend to be the least effective in minimising risks. Two approaches to reduce risk in this way are:-

Use Administrative Controls

- Administrative controls are work methods or procedures that are designed to minimise exposure to a hazard. These should be documented by both the system designer and the operator. System signage is part of administrative controls.

Use Personal Protective Equipment (PPE)

- In height safety, examples of PPE include fall arrest rated full body harnesses and shock absorbing lanyards. Personal protective equipment only limits the harmful effects of a hazard if workers wear and use the PPE correctly.

Administrative controls and PPE should only be used when there are no other practical control measures available or as an interim measure until a more effective way of controlling the risk can be used, or to supplement higher level control measures as a back-up.

1.3 RESTRAINT TECHNIQUE

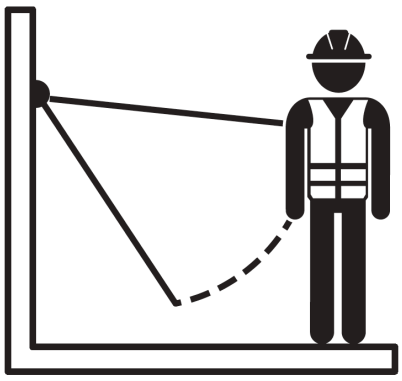
A fall restraint system is equipment that is used together to control a person's movement by physically preventing them from reaching a position at which there is a risk of a fall. The technique for using a fall restraint system typically consists of wearing a full-body harness that is connected by a fall arrest lanyard or rope lifeline to either a personal anchorage point, horizontal lifeline or horizontal rail system.

The system can be permanent or temporary, but must be installed in such a way that the correct use of the fall arrest equipment will prevent the user from reaching an area where a fall could occur or an unprotected edge.

A restraint technique system is suitable for use where:

a) The user can maintain secure footing without loading the restraint line and without the aid of any other hand hold or lateral support. When deciding whether secure footing can be maintained, consider:
   i. The slope of the surface.
   ii. The supporting material type
   iii. The surface texture of the surface and whether it is likely to be wet, oily or otherwise slippery.
b) The horizontal lifelines are fitted with an inline shock absorber(s) when
c) required.
d) The restraint technique system conforms with AS/NZS 1891 *Industrial fall-arrest systems and devices* series.

Figure 1 - Restraint Technique



This is restraint in it's simplest form. The lanyard prevents the user from reaching a position where they could free-fall.

Restraint technique should only be used if it is not reas oy providing a physical barrier (for example, a guard rail). This is because restraint technique may require a high level of user skill to operate safely and also greater supervision. A restraint technique system must be installed by a competent person in accordance with the manufacturer's instructions.

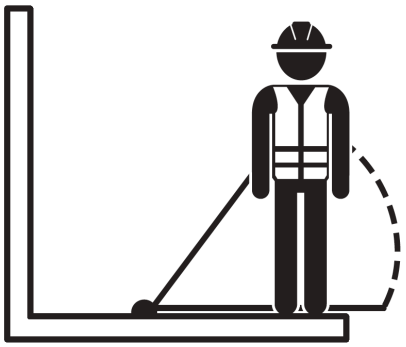
A restraint technique system, components and any end anchorages must be designed as a fall arrest system with regard to system design forces, in accordance with the principles outlined in AS/NZS 1891.4. The principle of this is if a restraint technique system is exposed unexpectedly to fall arrest circumstances, then the system design will still prevent a catastrophic failure.

A fall arrest system must be used instead of a restraint technique system if any of the following situations apply:

a) The user can reach a position where a fall is possible.
b) The user has a restraint line that can be adjusted in length so that a free fall position can be reached.
c) There is a danger the user may fall through the surface, for example fragile roofing material.
d) The slope of the roof or work area is greater than 15 degrees.

Figure 2 - Fall arrest risk

A worker exposed to a fall arrest risk must utilise a fall arrest system to ensure they are retained in the event of a fall to minimise the risk of injury.



Fall Arrest

A fall arrest system is intended to safely stop a worker falling an uncontrolled distance and reduce the impact of the fall. This system must only be used if it is not reasonably practicable to use higher level controls or if higher level controls might not be fully effective in preventing a fall on their own.

All equipment used for fall arrest must be designed, manufactured, selected and used in compliance with the AS/NZS 1891 series of standards.

Key safety considerations in using fall arrest systems are:

- The correct selection, installation and use of the equipment;
- That the equipment, anchorages lifelines and/or rails are designed, manufactured and installed to be capable of withstanding a minimum of twice the maximum force applied to them as a result of a person falling. This equates to a factor of safety of 2:1;
- That the system is installed as per the manufacturer's specifications and requirements;
- That the system is designed and installed so that the person travels the shortest possible free-fall distance (less than 2m) before having the fall stopped;
- That there is sufficient available fall clearance;
- That workers using a fall arrest system also wear adequate personal protective equipment (PPE), including helmets to protect them in the event of a fall;
- That if the equipment has been used to arrest a fall in the past that it is not used again, until it has been inspected and certified by a competent person as safe to use (if at all possible);
- In the event of a fall, a rescue procedure can be implemented.

> **Important**: Permanently installed, horizontal lifelines should **NOT** to be used for work positioning activities such as industrial rope access.

Permanently installed, proprietary horizontal lifeline systems as designed in accordance with AS/NZS1891.2, whether designed for restraint technique or fall arrest, cannot be subjected to any user loading in normal service, other than substantially horizontal restraint technique forces. They are simply **not designed** for work positioning purposes such as rope access use.

Horizontal rail systems **CAN** however be designed for restraint technique, fall arrest and work positioning and subjected to user loading if the design is approved by the system manufacturer. System data plates will advise on the rating of the system and whether it can be used for this purpose, or not.

1.4 RESCUE PLANNING

Whilst anchors may sustain the impact loads created during a fall (dynamic loads), they may be incapable of handling the static and additional dynamic loads necessary to rescue a person – particularly if the nominated rescue involves the weight of a second person.

A rescue plan shall not include use of an anchor previously loaded in the fall, unless the anchor AND the designed installation method takes account of rescue loads – this information should be verified and documented by the anchor System Designer. This information will likely require confirmation from the anchor manufacturer and also from the Engineer (structural) responsible for assessing the loads applied to the structure in a fall event if applicable.

Rescue plans shall be developed before work commences, and are an essential part of the Safe Work Method Statement (SWMS). Rescue plans will often require the provision of specific equipment to be used in the rescue.

Rescue plans will also generally require specific training for the users to ensure they understand how to use any equipment to swiftly perform a rescue. The rescue equipment should also be present on site during the work activities so that it may be deployed if required.

It is also recommended that workers do not work alone. A rescue plan may be good in-principle however if there is not a second person available to raise the alarm then the rescue plan will fail.

Dialling 000 is NOT seen as an effective rescue plan. Response times by emergency services and the need for specialised skills and equipment mean that an on-site capability is required in most cases, particularly for remote locations.

1.5 PRODUCT CERTIFICATION & STANDARDS COMPLIANCE

If a component of a lifeline system or an anchor has been certified or it carries a conformance mark, this does not mean that it can be guaranteed to work unless it has been installed correctly. This is the difference between a 'product or system certification' and a 'product or system installation certification'.

1.5.1 Product or System Installation Certification – This is the process by which a product or system installation is certified as being installed in accordance with manufacturer's instructions and is certified to perform to the design requirements. The 'System Installation Certifier' should be accredited by the manufacturer with a competency for the particular system or components so that the certifier can confirm that the system installation is installed to the manufacturer's specifications.

A site owner can therefore verify a system has been installed correctly, if they have been issued with an installation certificate by a Qualified Installer. More specific information about this documentation is detailed in Section 10.1.

1.5.2 Understanding Certification v Compliance

There are some misunderstandings about what product or system certification is vs. compliance. The differences are also complicated by the stage of product or system installation – from raw material specification, right through to installation. For example, a manufacturer may use a grade of steel or aluminium that has been manufactured to a certain manufacturing Standard, however the product that is produced at the end does not necessarily mean that it will comply with different product or installation Standard.

Outlined below is a summary of the key differences between product and system certification and compliance:

1.5.3 Raw Material Components for a Product or System

a) Product compliance – A product is deemed to be 'compliant' with a Standard if a manufacturer can provide evidence by way of test results that it will at least meet the defined

performance criteria of a specific Standard. This means the manufacturer is effectively self-certifying the performance of a product, in the absence of any additional third-party documentation.

b) Product certification – Is the process by which a testing laboratory verifies the ability of a product to pass a defined Standard. The laboratory must demonstrate they have the skills and equipment necessary to perform the testing function. A common method of assessing whether a laboratory is recognised as being able to perform this function is if they:-

i) Hold a current license for the National Association of Testing Authorities (NATA) accreditation;
ii) Have the testing regime that they are testing to on their scope of accreditation.

A number of manufacturers of fall protection equipment are NATA accredited; therefore meaning they have the demonstrated skill and have used testing equipment to complete the required testing.

The initial product certification process is defined as 'type' testing. This verifies that the products supplied at the time of the test were deemed to be able to meet the conformance requirements of the Standard. Refer to Appendix E2 for more detail. It is also highly recommended that manufacturers undertake 'batch' or 'product validation' testing. This second round, repeat testing involves testing batches of products using the same test methodology of the type test to prove the ongoing conformance of products manufactured over time.

1.5.4 In-situ Testing – Another important component of a testing program is to verify a product or system has been tested incorporating its fixing substrate. Only then will the testing program verify performance in an end-to-end environment. This is especially important with anchor point and systems installations as they are only a component of a total fall protection system. Each manufacturer should therefore be able to provide evidence that the product and substrate have been tested together and can sustain testing loads.

A way to verify if a manufacturer's product can be installed on your roof substrate for example is to request a testing certificate to verify this has been completed for your specific roofing profile.

1.5.5 Certifying Body – A certifying body is an independent, third party organisation that provides a verification that a product has been tested to meet a defined Standard and that they have reviewed not only the test results but the test methodology to verify the conformance. Companies that are deemed suitable as certifying bodies are required to:

a) Hold JAS/ANZ accreditation;
b) Have the specific Standard referenced in their certifying schedule;
c) Provide competent auditors to verify the testing methodologies and results for a specific product are true and accurate such that they can be marked with a conformance mark to be issued by that company.
d) Provide certificates of conformance for a product to a specific Standard.

There are a number of certifying bodies in Australia and New Zealand that are approved to act in this capacity. Each company has their own 'conformance mark' which effectively gives a person with a quick verification of the conformance of a specific product.

It is a requirement of Certifying bodies for manufacturers to undertake ongoing product validation testing in order to maintain the specific product certification. This provides peace of mind to

customers purchasing products on an ongoing basis that the products continue to perform as originally designed & tested, and that a change in sourcing vendor or product batches over time does not affect product performance.

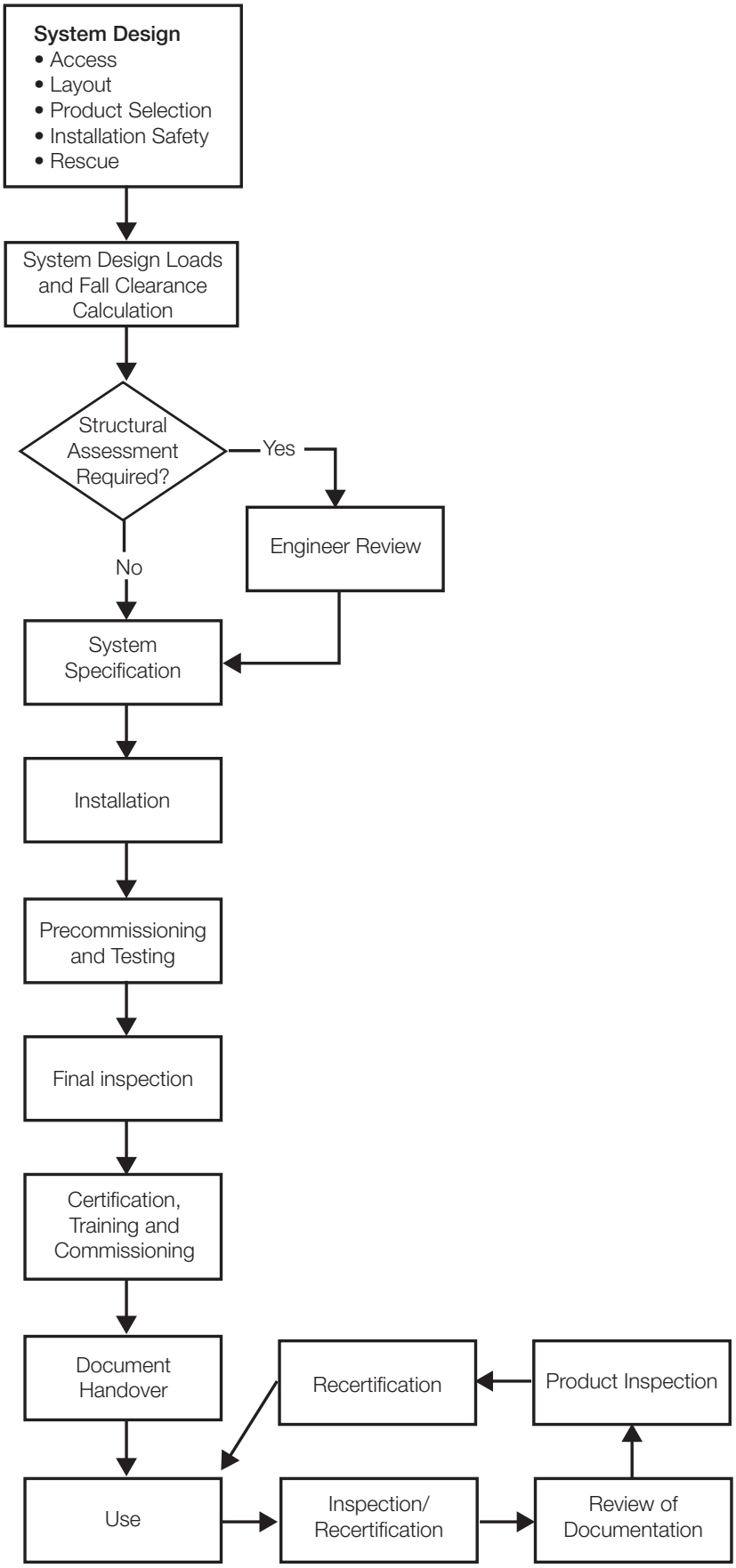
A certified product is therefore always compliant, as it is subjected to the testing regime to demonstrate its conformance, making it easy for a user to determine if a product will meet a Standard or not.

A ‘Compliant’ product is one that may have been originally tested by a vendor and has been shown to pass the requirements of the Standard, but does not carry a Conformance mark. A Compliant product may also be deemed as appropriate for selection/use and meeting a Standard, however the user needs to assess whether the documentation provided by the manufacturer is sufficient for them to make that choice. A ‘Compliant’ product is not necessarily inferior to a ‘Certified’ product; it just takes more work on behalf of the site owner of the system to make that assessment.

1.6 SYSTEM INSTALLATION PROCESS & KEY RESPONSIBILITIES

The design, installation and commissioning of a fall protection system of anchors attachment points or lifelines/rails involves a number of distinct steps, each performed by a person with defined skills. Some people may have the demonstrated skills and competency to perform more than one task.

Figure 3 - System Installation process



The installation process is a simple progression of steps to ensure a safe and reliable system is affixed to a defined structure. Regardless of the simplicity or complexity of the installation, it is essential all steps are completed to ensure a system is safe for use.

1.7 DESIGN

The safety of any fall protection safety system is primarily defined by the initial design. Poor design can increase the likelihood of a system being unused or impact the ability of a person to complete their task safely or effectively. Conversely, an excellent system design enables a person to access a system with ease, limiting the chance of an injury and indeed should assist them to complete a task efficiently without risk to themselves or others.

It is recommended that designers of fall prevention systems reference the model Code of Practice for Safe Design of Structures when contemplating their system designs. Cross reference to the State/Territory Regulator requirements around the adoption of these principle should also be contemplated.

The initial stage of design should be the **'Use definition'**, by outlining the tasks to be completed at any time when a user is on the system (e.g. gutter cleaning, air-conditioning maintenance). The System Designer will then develop a layout that shall take into consideration access to the system and rescue in the event of a mishap. The System Designer should first consider creating a Restraint Technique System before a Fall Arrest system.

1.7.1 Design and Rescue

Whilst the chances of an incident could be very low, the overall layout, product selection and design of the installation is required to take account of the possible rescue requirements following a fall onto the system.

Whilst some anchor points are designed for two person loads, others are not suited to be used to perform a contact rescue from (where a second operator is lowered to retrieve a disabled operator) whilst connected to the same anchorage point. In other cases, **deforming anchors** may become damaged in arresting a fall and may also not be suitable for rescue purposes.

In these circumstances, the System Designer may need to specify additional anchors to enable an effective rescue to take place. In finalising their designs, the System Designer shall therefore ensure that the documentation to be handed to the Asset Manager/Owner sets out the intended (recommended) rescue method.

Appendix G provides greater detail concerning anchor design for rope access applications.

1.7.2 Multiple Anchor v Lifeline Solution - how do I decide?

When applying the Hierarchy of Control, it is generally safer to choose a passive system solution in place of a lifeline or anchor system to provide a higher level of safety for users. Passive systems do not require as much training and are easier to access in many situations.

If a passive system is not practical however, then the choice of a lifeline or multi-anchor solution might be deemed appropriate.

Horizontal lifelines and rail systems generally offer the user a safer environment than a multiple anchor point solution that requires the user to attach and detach to traverse an area, in order to perform the required work. Multiple anchor point installations require a higher level of user skill to operate safely and also greater supervision. As such, multiple anchor points should not be considered before horizontal lifelines and horizontal rail systems in the Hierarchy of Control.

1.7.3 Product Selection

Once the primary applications and tasks are identified, product selection becomes an important feature in design. Section 2.1.1 demonstrates a multitude of typical anchor application types. Additionally, a horizontal or vertical system may be a more suitable alternative, or complementary alternative to anchors points given the building or structure design.

Whichever system is chosen, it is essential for the system to be designed in accordance with a suitable product manufacturing Standard. It should also consider the structure to which the system is attached, with evidence that areas such as roofing profiles have been tested in conjunction with these systems and proven to pass the relevant Standard.

A detailed summary of the product Standards is referred to in Appendix B, with additional information on Anchor point design and ratings shown in Appendix C.

Additional considerations in the layout are:

- How many people are required to be working at one time;
- The skill level of users;
- Fall clearances;
- Objects on the structure that a falling person may come into contact with;
- Lanyard / Rope contact over sharp edges;
- Pendulum falls;
- Supervision.

There are a multitude of layout designs that might be considered for different structures, as well as products that are suitable for different applications. Section 2.1.1 details major considerations in layout design principles and hazards. Appendix G2 also highlights common issues associated with poor design.

1.8 STRUCTURAL ASSESSMENT / ENGINEERING REVIEW

There is no point installing a fall protection system that is rated to defined performance loadings if the structure to which the system attached is fundamentally incapable. The System Designer must consider how the loads from the system or anchor are to be transferred to a structure in a fall event and ensure the structure is adequate.

Other considerations around structural assessment include product type, fixings, access to and from the system and the substrate. It is therefore not just about a product design and installation - it's about a **total system of safety** to achieve system access from start to finish.

System Designers shall ensure the system is:

- Fit for purpose;
- Capable of sustaining loadings;
- It can be used, installed, tested, inspected and maintained to the manufacturer's requirements.

Different manufacturers offer different methods to assist a System Designer determine that loads are appropriate for a defined structure. Some manufacturers provide minimum design load guidelines. This information is usually supported by testing documentation.

Manufacturers of vertical and horizontal lifelines and rails also sometimes provide calculation programs that can provide a report detailing expected loads, using predefined engineering calculations. Whichever method is chosen, it is contingent upon the System Designer to ensure the load capacity of the structure is adequate and in the absence of definitive evidence, must call upon an Engineer to assess the structure accordingly.

1.8.1 Engineering Review and Design of the Structure

If an engineering review is required to be undertaken, the Engineer must perform calculations or assessments to determine if the potential loads being applied to a defined system will impact the structure negatively in any way.

In some cases, reference to an Engineer is essential wherever anchors are fixed into substrates whose structural ability cannot be readily verified. Some examples include:

- Natural Stone
- Brickwork
- Block-work
- Hollow Core concrete
- Slab with screeds
- Edges of slabs
- Parapets
- Timber
- Roof sheets (Except where roof sheets and structure meets the anchor manufacturers requirements defined in testing)

For concrete, (e.g. tilt-up panels, roofs), ensure that the concrete is at least 20MPa. This must be verified and proven. It is recommended that System Designer shall take account of these issues in design stage, well before installation takes place to ensure that the correct materials for installation are ordered and provided.

1.8.2 Special Considerations: Installations into Masonry / Block-Work / Concrete / Hollow Core Panels

In these types of substrates, additional precautions are required to ensure the successful installation of a product. Proof load testing shall be performed on each and every anchor/fastener that is drilled in (i.e. friction or glued in). The load test shall be to 50% of the anchor's design load (e.g. for 15kN anchors, test to 7.5kN). The load shall be held for a period of 3 minutes without failure.

If the concrete has visible signs of spalling, cracks wider than 1mm or chemical corrosion, then a sample should be taken and tested and verified that it is adequate. Copies of any testing documentation demonstrating the proof load completion should be supplied as a component of the hand-over documentation.

1.9 INSTALLATION / MANUFACTURER'S INSTRUCTIONS

1.9.1 Installation

The installation process is not one job – it involves the series of steps required to complete the end-to-end job of the installation. Components of the job include:

1. Risk assess the work area for hazards;
2. Complete Safe Work Method Statements (SWMS);
3. Access the structure safely – e.g. utilising Elevated Working Platforms (EWPs), ladders, scaffolding or other structure to complete the task;
4. Compile and transfer the system components and tools onto the worksite;
5. Install a safety system on a defined structure;
6. Obtain system installation certification from the relevant person;
7. Following installation, remove the installation tools, excess materials and debris from the structure;
8. Remove all temporary restraint / fall protection or rope access equipment from the location once systems are confirmed as functional;
9. Safely exit qualified installers and contractors from the site once complete;
10. Complete the final inspection;
11. Complete handover of site documentation to the site owner/manager.

1.9.2 Manufacturer's Instructions

Every manufacturer **must** be able to supply instructions for the correct installation of their product. Installation of all anchorage and lifeline products shall be in accordance with the manufacturer's instructions.

1.10 COMMISSIONING AND CERTIFICATION

1.10.1 Commissioning

In a sense, the commissioning, testing and certification process is a sub-set of the installation process. It is specifically identified in these guidelines due to the importance of its place in the installation process.

Commissioning shall include the following documentation which is an essential part of the system manual:

1. A layout of anchors/rigging plan/lifeline design and types of devices used with each element clearly identified;
2. Inspection requirements for each anchor or lifeline system;
3. Testing results (if required) for each anchor or lifeline system;
4. Labelling in accordance with Section D5.1 (entry point plate) and AS/NZS 1891.2 for anchor, lifeline and rail installations;
5. Maintenance requirements and instructions
6. Operator instructions, number of users, training and hand-over to the client on completion.

Refer to Appendix F for further information and suggested documentation for the commissioning process.

Once the product has been installed, swages, anchorages and other components must be tested, as required. This is particularly important for friction and glued-in anchors and base plates.

Deforming roof anchors and systems may not be required to be pre-tested - however manufacturer instructions will define this requirement.

1.10.1.1 Compliance Placards / System Entry

The Compliance Placard (also known as an Installation & Service Record) is an important part of every safety system as it provides essential information to users prior to system use. In order to minimise the risk of unsafe use, the placards should be placed in a position that it is at an average eye height of a person. This enables the worker accessing the system to understand the required information prior to using any part of the installed system, including the first access point. e.g. permanently installed ladder access bracket.

It is strongly recommended that the Placards be placed either on the wall directly below the access point or door, just prior to accessing the system. If this is not possible, it should be placed on a location like the fascia, so that it can be still read and understood prior to accessing any part of the system.

The Compliance Placard should incorporate the minimum information, which includes:

1. Manufacturer / suppliers and / or the installer's company name;
2. A unique identifying number;
3. Year / Month of installation;
4. Type of anchorage or static line system;
5. The KiloNewton (kN) rating of the system or systems (minimum);
6. How many persons can use the system and dates and details of inspections & services;
7. Have all fields populated - some compliance placards supplied by installation companies contains irrelevant fields which should be marked "not applicable" in the event these are not required or in use.

In addition, in order to be compliant all Compliance Placards must be:

- Legible
- Have all fields populated
- Be consistent with the kN ratings and the number of people for the installation and the individual Inspection labels

It is also strongly recommended that compliance placards be replaced if:

- They have become damaged/destroyed over time;
- If date areas are consumed / full;
- Information is not consistent with actual installation details.

1.10.1.2 Lifeline / Rail System Data Plate

In addition to a system entry compliance placard, all horizontal and vertical lifeline equipment that is installed shall be labelled with a separate weather proof data-plate and current service tag. There may be circumstances when the rating level for different pieces of equipment installed on a structure are different. It is therefore essential that each individual system has a data plate that includes:

1. Manufacturer, supplier or the installer's company name;
2. A unique identifying number;
3. Year / Month of installation;
4. Type of anchorage or static line system;
5. The KiloNewton (kN) ratings;
6. How many persons can use the system and dates and details of inspections & services.
7. Refer to AS/NZS1891.2 for additional information about this labelling requirement.

1.10.1.3 Anchor Data Plate / Compliance Sticker

The AS/NZS1891.2 Standard allows for the provision of an anchor layout plan at the system entry point in lieu of separately labelled and certified anchors. There is however a potential issue that with subsequent installations and inspections occurring, or in the event of additional anchors being added for new applications, that the layout plan method at entry point can become incorrect. So therefore whilst technically in compliance, this practice of a layout plan at system entry in lieu of individual anchor certification and tagging is therefore **NOT** recommended by this code.

In preference, addition to the system entry compliance placard at system entry and the lifeline systems data plates, is is strongly recommended that each individual anchor attachment point shall be individually tagged. This will ensure that any changes in anchor layout are not missed during a recertification process in future years. Either way, all changes to the installed anchors on a structure must be reflected in a revised layout plan at system entry should that method be adopted.

Each anchor must therefore have a data plate / compliance sticker that includes:

1. Manufacturer, supplier or the installer's company name;
2. A unique identifying number;
3. Year / Month of installation;
4. Date of last inspection and expiry;
5. The KiloNewton (kN) rating.

For further information, refer to the anchor marking/labelling requirements outlined in Section 2: Test Loads and the Checklists in Appendix D5.1, Appendices F and G.

1.10.2 Installation Certification

Installation Certification is different to Product Certification (covered in Section 1.5). The Installation Certification is the result of the process by which a Competent Person determines that a product installation is consistent with the manufacturer's specifications and the layout specified by the System Designer.

A full certification shall consist of:

- Collating and reviewing the documentation for the system, including anchor compliance statements, system design information, load calculations, proof loading results, testing records

and user instructions.
- An inspection of the installed system that it meets the System Designer and Manufacturer requirements.
- Issuing a compliance certificate once all requirements are satisfied.

Self-issued certificates of compliance are only considered valid if they are provided in conjunction with the supporting evidence as outlined above.

Some manufacturers or installation companies may also have a centralised system of project or 'system registration' in place, which allows for an effective cross-reference that a design and installation is registered as being compliant. Verification of the availability of this process can be sought through the installer or directly with the manufacturer.

1.11 DOCUMENTATION HANDOVER

1.11.1 Documentation Handover

A handover of all documentation is required at the completion of the installation. This documentation is a collection of all the information above into a hard bound folder/electronic folder or both. This provides the end client with the evidence that their systems have been installed in accordance with the manufacturer's instructions and that the systems are compliant.

This documentation should be accessible at all times by any contractors or employees that may have a need to access the fall protection systems installed. It will also provide valuable information about the timing for re-certifications, hazards and any other important considerations regarding system use.

It is important that a documentation handover is not just a process of sending the information in the mail or passing it over without explaining the contents to the relevant person so they know how it can be used to manage the safety of operators for the systems on their site.

A summary of the contents of a typical 'best practice standard' handover manual will include:

- **Conformance certificate(s)** - This might be in the form of individual certificates for each anchor or system, or a summary sheet detailing a site compliance certificate;
- **Conformance Report / Risk Assessment** - Even though a safety system might be installed on a building, the means of access might not provide safe access across the entire site/structure as the frequency of access in locations is infrequent/unnecessary. In these circumstances it is wise to provide a risk profile for these locations so operators understand the limits of the current systems in place;
- **Forms / General Safety Information** - Although not mandatory, the utilisation of a roof access permit system is something many companies choose to put in place as a risk control measure. Samples of such documents can be a good start for entities wishing to pursue using this system.
- **Inspection Records** - These are the records of the inspection completed by a competent person for the products in stalled on a structure. This history is an important record of ongoing compliance and providing evidence that the procedures for maintaining the safety systems is in place.
- **Inspection Register** - This register is a historical record of the inspections completed on a structure over time. This is an important record of ongoing compliance and providing evidence that the procedures for maintaining the safety systems is in place.

- **Layouts** - this is a visual representation of the system layout on a typical roof / overhead structure across the site. These layouts should be of a size or resolution that can be read / zoomed out so that detail, position or reference numbers can be read. Scanned system designers "CAD" drawings are often unreadable or with such poor resolution they are not tenable as a reference document.
- **Load Calculations documents** - These are documents supplied by the manufacturer that provide summary model engineering calculations for the combination of components for the horizontal lifeline system specifically designed for the customers site. They provide evidence that the system loadings are within the correct tolerances for safety.
- **Manufacturer testing / certification documents** - these verify that the systems and anchors used on your specific roof profiles have been tested by the manufacturer and demonstrated conformance. Although not essential, these provide peace-of-mind.
- **Personal Protective Equipment (PPE)** - A listing of any special components required (lanyards, self-retracting lifelines, mobile traveling devices, slings, rope protection etc.) to use the system safely should be explained.
- **Rescue** - The intended (designed) rescue method should be detailed where possible.
- **Product brochures / user instruction manuals** - Such documentation will be specific to the system installed on the site. These documents are generally provided by the manufacturer and provide useful information about product use requirements.
- **Site / Product Photos** - Although not mandatory, these images are a useful tool for Workplace Managers and system users to understand the nature of the products on the structure and evidence they remain compliant over time. This is important as many products require a visual inspection.
- **Exclusion Zones** - These should be identified as areas to avoid accessing. Many structures do not have a system for height safety access across the entire structure as there may be little need for providing one. By identifying the exclusion areas, a Workplace Manager and operator is better informed about the safe places to access and egress a safety system.
- **Requirements for testing and re-certification** - Generally this procedure is done in accordance with standard inspection timeframes (generally annually, however items of PPE require inspection by a Competent Person at least 6 monthly. There also may be locations where the operating environment is extreme and therefore more frequent inspection may be required. These details should be noted in the handover manual. Note also that inspection requirements differ between jurisdictions, with some requiring 6 monthly inspections while others are 12 months. The documentation should be specific regarding inspection frequency, levels of inspection (including testing, where required), layout plans and operation instructions.

Whilst all this information should be available in the hard copy hand-over folder/manual, some companies can also provide this information electronically, which can be a useful strategy to manage the loss of this important documentation, also allowing it to be shared amongst those who need it.

2. EQUIPMENT GUIDELINES

2.1 Fall Arrest Anchor Systems

2.1.1 Typical Anchor Application Types

The diagram, below shows examples of typical applications for fall protection anchors. This list is not exhaustive, however covers off a significant number of typical applications for these types of permanently-mounted anchors systems.

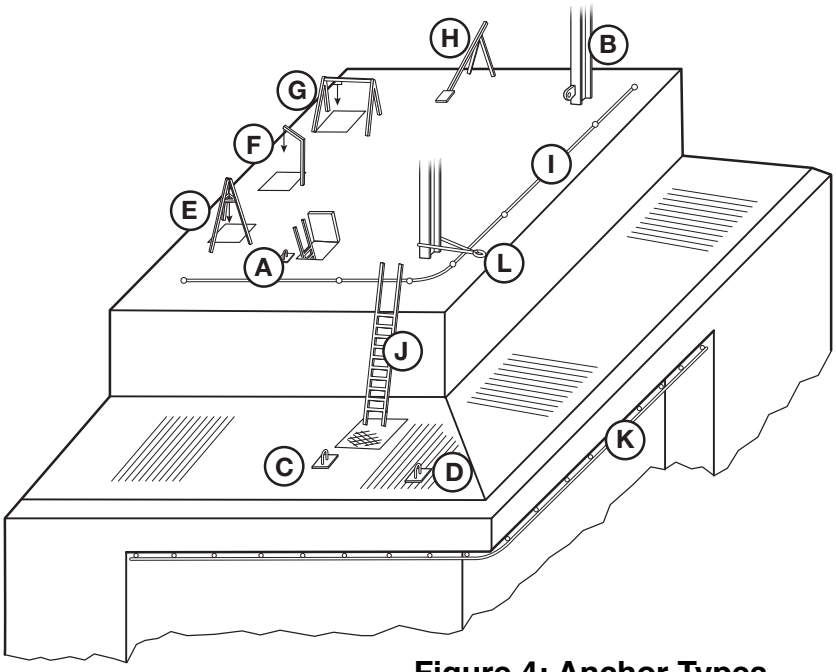


Figure 4: Anchor Types

Diagrammatic layout of anchor types	
A	Anchor point through bolted or drilled into masonry (friction, undercut or glued in), or cast in
B	Anchor point welded or bolted to structure
C	Top fixed anchor utilising fixings to purlins AND, on occasions, roof sheeting
D	Top fix anchor fixed to roof sheeting only
E	Portable anchor—tripod. Covered under AS/NZS 5532:2013
F	Portable anchor—davit. Covered under AS/NZS 5532:2013
G	Portable anchor—beam. Covered under AS/NZS 5532:2013
H	Portable anchor – counterweighted structure. Covered under AS/NZS 5532:2013
I	Horizontal lifeline – AS/NZS 1891.2:2001
J	Ladder fall device – AS/NZS 1891.3:1997
K	Horizontal life rail – AS/NZS 1891.3:2001
L	Improvised anchor using structure – not part of AS/NZS 5532:2013

2.1.2 Anchor Layout and Spacing

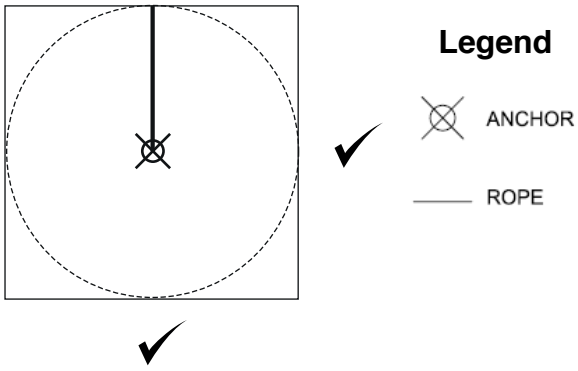
An appropriate layout for an anchor system is as much an art as it is a technical skill. The challenge for all System Designers is that they have to use a combination of many pieces of information to pull together a safe solution. As every building/structure is different, it is impossible to define a ‘correct’ layout for every scenario. There is also the complication that one System Designer’s view of a correct installation may vary slightly from that of another. At the end of the day, the design or layout must be logical, explainable and show how risks are effectively mitigated.

Given the challenge of defining a typical/preferred anchorage system layout, a summary of different installation options are shown in the following pages. These layouts are not prescriptive, but are possible solutions that have been prepared by those with significant experience in the design and installation of these systems on the past. These scenarios are designed to provide ‘principles for design’ that can be referenced in design documentation.

All layout scenario drawings are in ‘plan’ view. Each scenario is explained using a simple guideline. A tick reflects a suitable design, a cross reflects a scenario where there is a risk of a fall occurring, a design flaw or other issue and is therefore not recommended.

Scenario A: A centrally located single anchor point on a square shaped building, with a fixed length lanyard that extends no further than the shortest distance.

Figure 5: Single, centrally mounted fall arrest anchor

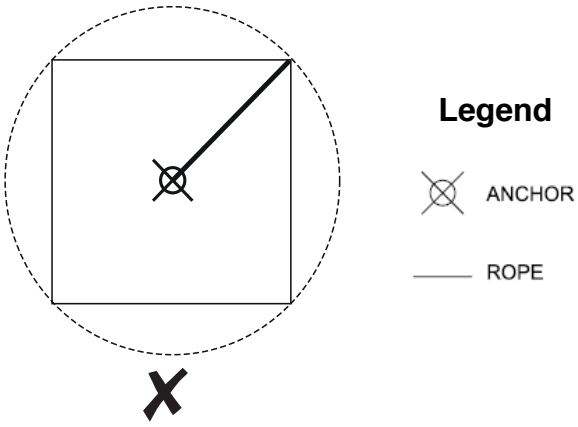


In this scenario, the user is prevented from reaching the edge of the building and therefore from falling by the rope system retaining them. In theory, the distance of the rope system can be customer designed for the size of the building. In most cases it will be difficult to get a rope custom-designed, so the user can utilise an adjustable rope lifeline and restraint technique to limit their access to the shortest distance.

Tick - this anchor location and process gets a tick because the person cannot fall off the building. It's obvious shortfall however is that the person cannot access the corners of the building, and therefore may be tempted to adjust their rope device beyond this length. In doing so they may be subjected to a pendulum fall - refer to Figure 7.

Scenario B: A centrally located single anchor point on a square shaped building, with a fixed length lanyard that extends to the corner.

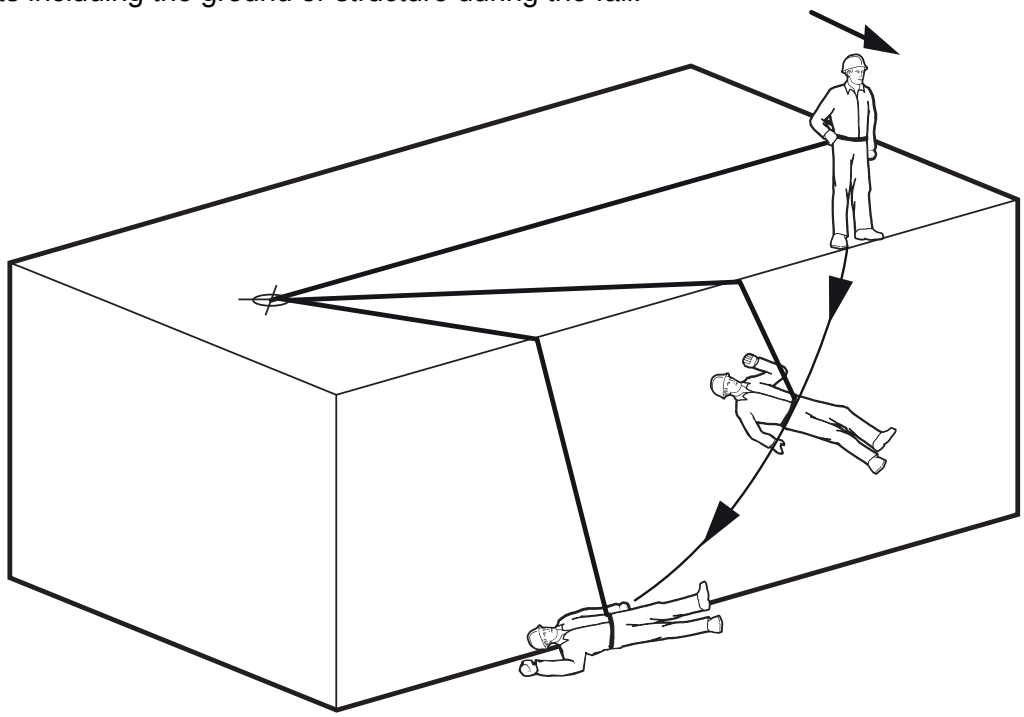
Figure 6: Single, centrally mounted fall arrest anchor



Cross : This system allows a fall. The rope or tethering device can be extended to the corners. If a person accesses the corner, there is a possibility they could fall over the building edge and be subjected to a pendulum fall.

Figure 7: Pendulum Fall

The risk of a pendulum fall is not limited to the high fall distances – the potential for severing of the safety line is greatly increased, as well as the potential for impact with other objects including the ground or structure during the fall.



To mitigate the risk of a pendulum fall, Scenario C defines the use of Diversion anchors to manage the fall risk.

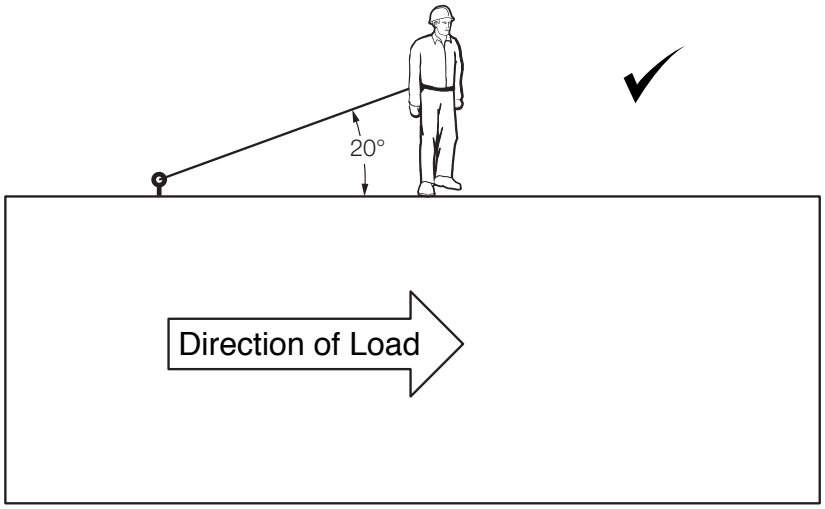
Anchor Installations in Tension vs Shear

There has been some confusion for many years about whether an anchor installation in tension vs shear configuration is deemed acceptable or not. This issue is primarily concerned with anchor installations into masonry or concrete using glued-in or chemical set anchors. The Standards AS/NZS5532 and AS/NZS1891 do recognise that this type of fixing method is acceptable, providing specific conditions are met. Refer to Appendix C for specific guidance on these anchor installation types.

At this point in time, the use of screwed-in and chemical set/glued in anchors has NOT been recommended for installations where the fixings will be in 'tension'. This has been due to the significant volume of anchors that have failed inspections due to poor installation as well as the potential for substrate degradation over time, despite the requirement for in-situ, annual proof-load testing . The evolution of new materials and higher competencies for installation may change this viewpoint over time. In the intervening period however, it is recommended that a professional engineer be required to certify this type of installation in each application in order to be deemed appropriate.

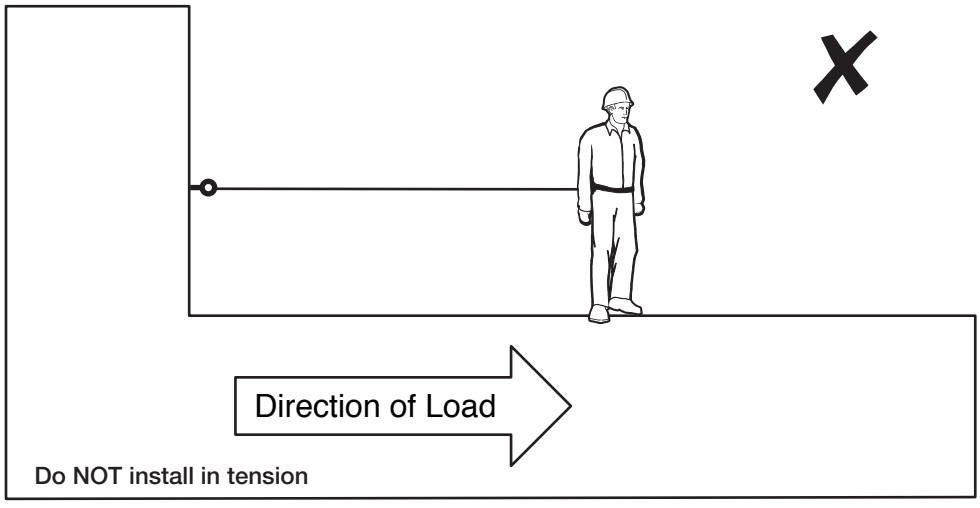
Anchor installation in 'Shear'
This means that the anchor must always be installed in a way that the force that would be applied in the event of a fall would be perpendicular to the direct of installation.

Figure 8: Concrete Anchor Installation in Shear



Anchor installation in 'Tension'
This means that the anchor could be installed in a way that the force that would be applied in the event of a fall would be in direct line with a fall force that may be applied. This can be very dangerous, depending upon the substrate, type of anchor used and whether there is a sandwich/ backing plate fixing method employed, if installation instructions from the manufacturer are followed, and so on.

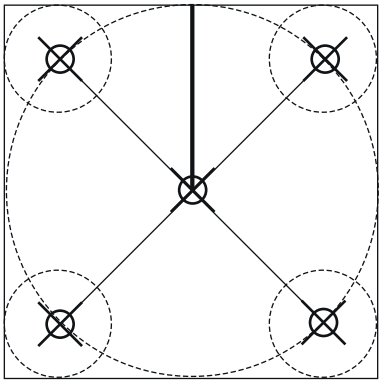
Figure 9: Installation in Tension



Please refer to manufacturer-specific information for further details.

Scenario C: A centrally located single anchor point, with 4 separate anchors located within the maximum radius of the central anchor.

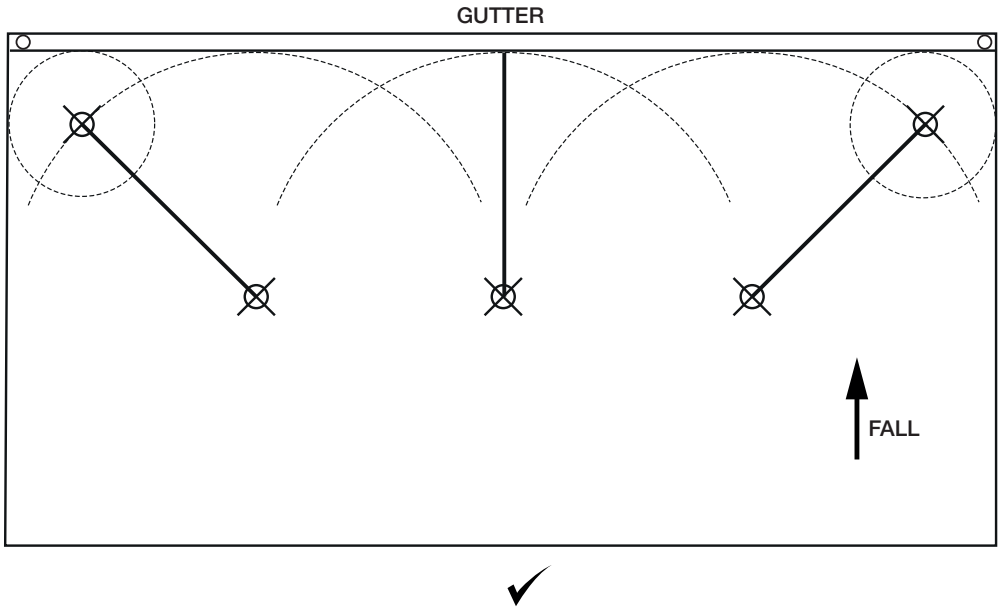
Figure 10: Diversion Anchors



Tick: This system gets a tick as the corner diversion anchors provide an additional connection (or diversion) point, such that if a person was to fall, their risk of a pendulum fall has been eliminated. Care should be taken to adjust the rope line or lanyard to remove the risk of a fall over the edge at the corners.

Scenario D: Task – gutter maintenance. One part of the roof of a rectangular building is shown, where a gutter is located on one side. Access from the roof shall be via a set/secure location to set a ladder bracket. The location of a suitable anchorage point in the corner is also available for attachment to allow the worker to transition from the temporary ladder onto the roof surface from the outside of the building.

Figure 11: Gutter Maintenance with Diversion Anchors

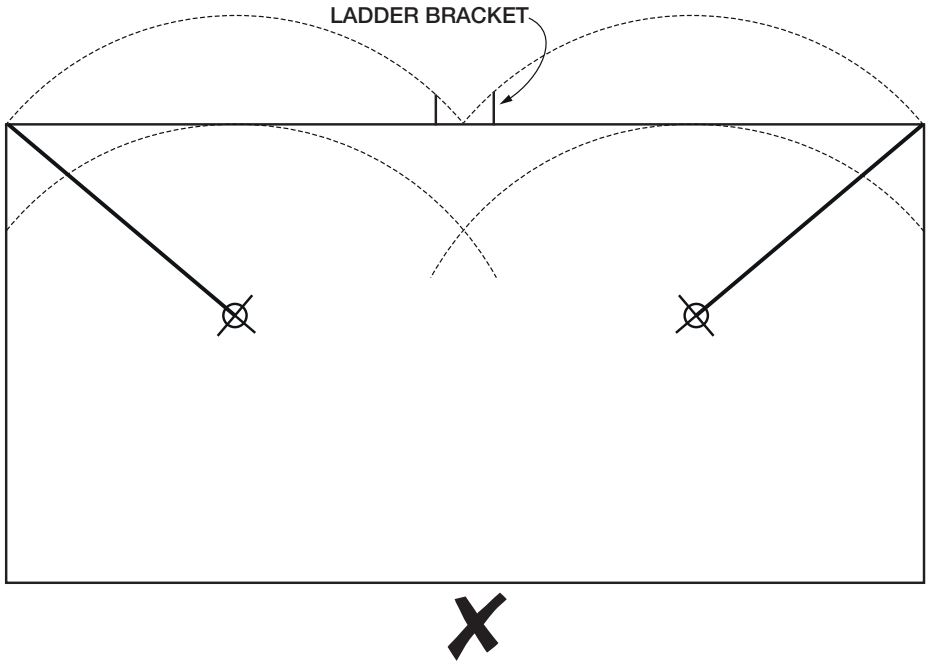


Tick: This system gets a tick as the corner diversion anchors provide a safe point to connect to during access. They can also act as an interim connection point during transition to the centrally

mounted anchors, such that if a person was to fall, their risk of a pendulum fall has been eliminated. The gutter can now be cleaned using the centrally mounted anchorage points for the task, with the corner anchors re-used again during egress from the building.

Scenario E: Task – gutter maintenance. One part of the roof of a rectangular building is shown, where a gutter is located on one side. Access from the roof has been set centrally using a ladder bracket. There are two centrally located anchors designed to be used to clean the gutters.

Figure 12: Gutter Maintenance with no Diversionary Anchors



Cross : This system gets a cross as there are significant risks to the users of the system.

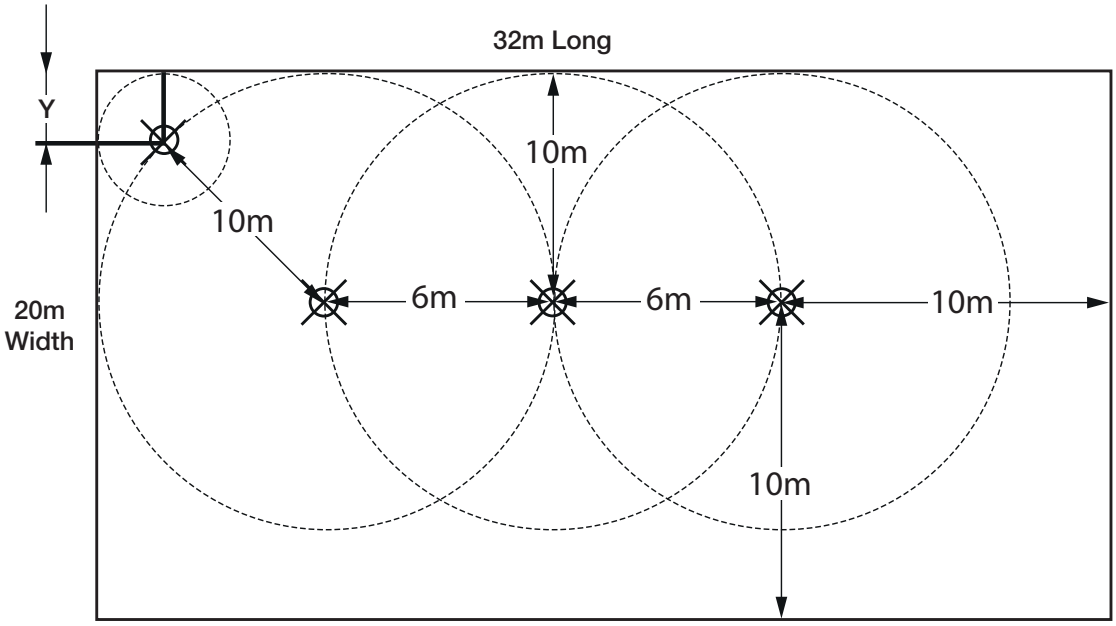
Issue 1: Insufficient anchors have been provided to ensure the safety of the operators. Initially, if a user accesses the roof via a temporary ladder, during the transition to the roof surface, they are not protected from a fall by having access to a secure connection point.

Issue 2: The anchors are too far apart to be able to connect with a standard lanyard. Although a user may reach the centre of the roof by walking and connecting, they are still unconnected. Additionally, there may be brittle roofs, skylights, uneven surfaces and other hazards present where a fall is possible.

Issue 3: With a longer lanyard or rope line, the user is exposed to an excessive pendulum fall if they access the corners of the roof.

Scenario F: Anchor system in straight line configuration - Spacing distances between anchors need to be carefully considered. This diagram shows a rectangular roof and denotes important information about the spacing distances between anchors.

Figure 13: Anchor System in Straight Line Configuration



Key criteria to be applied during all anchor layout designs:

(1) The spacing between the primary anchors is NEVER more than the distance away from the fall edge;

(2) Never go more than 6m between primary anchors as this will create large 'dead zones' which are inaccessible areas;

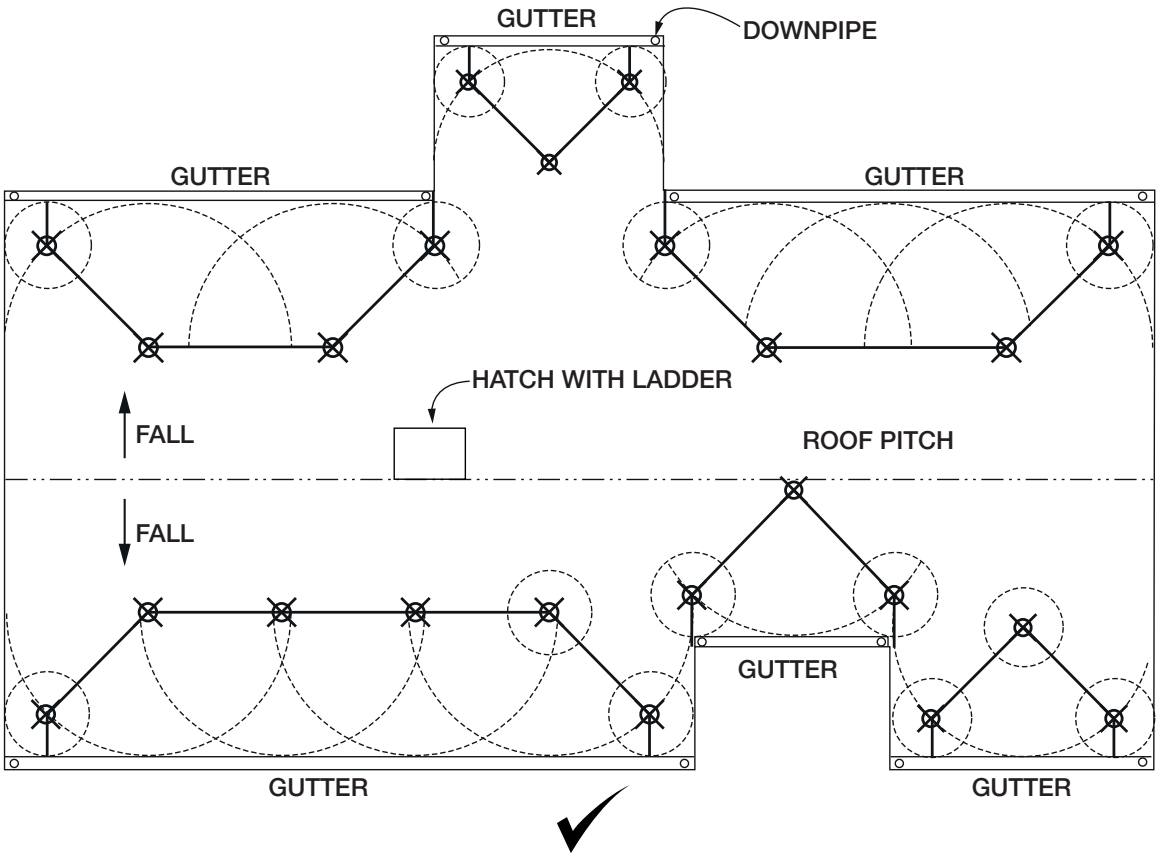
(3) The primary anchor must always be placed such that the distance from each of the sides are the same (positioning of purlins may restrict this slightly);

(4) When the anchor distance away from the fall edge exceeds 6m, the distance between the anchors MUST NOT exceed 6m - ie, if the spacing away from the fall edge is 8m, the first anchor will be 8m away from the edge, but the consecutive anchors will be spaced at 6m apart;

(5) Y (Diversion Anchor) should be placed no more than 3m away from roof edges. This allows the user to safely access the corner.

Scenario G: An example of a typical anchor installation design that has considered of all scenarios, risks and hazards identified above.

Figure 14 - Multi-Anchor Layout



2.1.3 Anchors fixed to roof sheeting (ONLY)

This application is very common in the Australian and New Zealand market. AS/NZS 5532 provides testing guidance to manufacturers for this application. The testing requires the manufacturer to prove the ability for the anchor to stay connected to a typical piece of roof sheeting under "laboratory test" conditions.

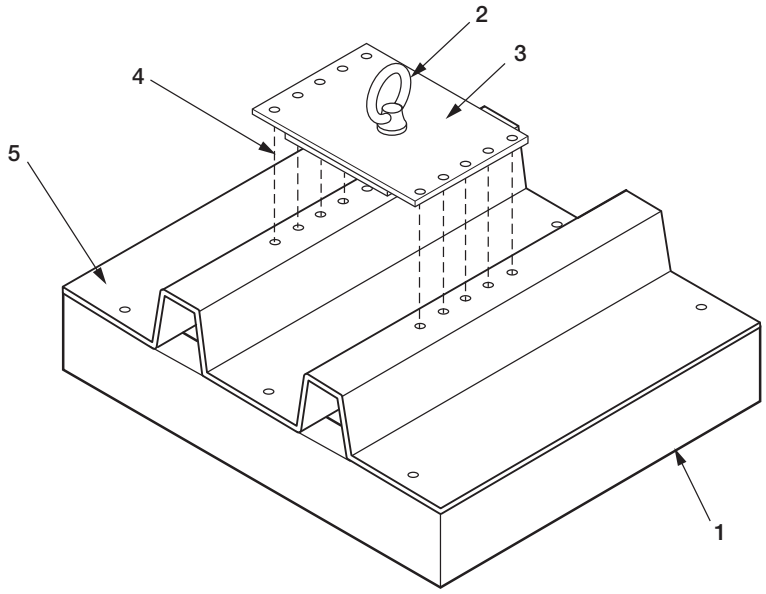
When a manufacturer undertakes this testing, the conditions of the testing (e.g. roof sheeting type and thickness, fixing method, purlin/rafter type and spacing) forms the basis requirements for site installation. In many cases, there will be additional fixings required to be added to the roof sheeting in and around the anchor position in order for the anchor to sustain the test load.

The System Designer shall ensure that the following requirements are documented and met based on the type testing:

- Roof sheeting - same configuration
- Roof sheeting - same base metal thickness (BMT), or thicker
- Purlin size - same size and thickness or deeper and thicker
- Purlin spacing - same or closer
- Fixings on the roof - in good condition
- Roof sheeting - in good condition
- Additional fixings installed if required
- Steel size and thickness
- Concrete thickness
- Timber dimensions and grade

If these conditions are not met, then the anchor shall not be installed or re-certified.

Figure 15: Typical "Top Fixed Anchor" (fixed to roof sheeting only, with no connection to purlins). Illustration has been directly sourced from AS/NZS 5532.



(a) Surface mount

Legend

1	Structure	4	Fixings
2	Personal attachment point	5	Roof sheeting
3	Anchor device		

Note that there are anchors in the market that fix through to the purlins as well. Essentially it is the obligation of the manufacturer to demonstrate the safety/conformance of the anchor with compliance to the testing methodology. It is up to the system Designer to ensure that there is adequate spacings, fixings and correct placement of the anchor on the roof surface.

2.1.4 Product Selection

One of the most significant decisions a designer has to make is to determine the most appropriate anchor type to be installed in the location it is to be used. This is significant as virtually all buildings are different. In many cases very similar building designs may well require different anchors to be installed, depending upon the nature of the tasks to be completed and the location of sub-structure. Product selection in this instance is critical - and product performance attributes will define the appropriate selection(s) to be made.

2.1.4.a Anchorage Strength Requirements

Strength requirements for fall protection anchors are defined in AS/NZS1891.4 Industrial Fall Arrest Systems & Devices - Selection Use & Maintenance, Section 3 - Anchorages. The use and requirements for activities in the location will assist the system Designer to determine the strength requirements of the product, prior to making their selection.

The environmental conditions of the structure are another element of consideration. Proximity of the roof sheet close to coastal regions where additional corrosion risks are present, must be considered.

Permanently installed fall protection anchors can be either **non-deforming** or **deforming**.

2.1.4.b Non-deforming anchors

As their name suggests, non-deforming anchors are not designed to deform under a fall arrest load - or if they do, the impact on the anchor will be minimal. In this instance, the impact load on the structure to which the anchor is attached will be potentially higher than that of a deforming anchor.

Conversely, as the anchor does not deform, the energy absorbing device (e.g. lanyard or self-retracting lifeline (SRL)) used by the operator will perform the task of absorbing the force of the fall (to less than 6kN). It is easier to determine the fall distance in this instance as there is only one ‘moving’ element in a fall event. Fall clearance tolerances in this instance may be easier to determine.

Non-deforming anchors are often chosen as they can be used for work positioning activities, such as industrial rope access or for suspension in a bosuns chair to perform work in difficult locations.

2.1.4.c Deforming anchors

Deforming anchors are designed to deform under a fall arrest load. In theory, this will mean that there may be a lower force placed onto the structure to which the anchor is attached, than a non-deforming anchor. This is seen as an advantage - particularly in buildings where the structures are light weight.

It is still recommended that a user utilise an energy absorbing device such as a fall arrest lanyard assembly when connecting to a deforming roof anchor. To understand the differences in the load

on a fall protection anchor when using a fall arrest lanyard assembly, contact the manufacturer directly.

As a lanyard assembly requires a certain amount of force to work properly, the deforming action of the anchor may well reduce the traditional length of tear-out of these types of devices as there is an offset in the peak load applied to the person. Therefore as no defined deforming ‘percentage' or standard presently exists, contact the individual manufacturer to confirm this information. Additionally, the manufacturer should provide guidance on any adjustments to fall clearance calculations that may be required with respect to using deforming vs non-deforming anchors.

2.1.5 Strength Testing

The AS/NZS 1891.4 Standard defines the strength requirements for fall protection anchors. Reputable manufacturers will supply all anchors marked with their strength rating. Products without a rating should not be used.

After installation, the majority of fall protection anchors do not require a post-installation test procedure to verify their strength, with the exception being chemical-set (glued in) anchors. Most fall protection anchors require a visual inspection - refer to details under ‘test loads’ section.

The reason most styles of deforming and non-deforming anchors are not required to be tested periodically is that as long as the anchors have been shown to pass testing in a laboratory environment to the requirements of AS/NZS 1891.4 and/or AS/NZS 5532, they have demonstrated their ability to pass such a load. The visual inspection alone allows for an assessment as to correct fixing, corrosion, deformity or identifying other factors that might deem the device inoperable.

Additionally, if any load is applied to a deforming anchor, any applied strength test would require the anchor to be immediately replaced, as it will have already performed its role - to deform under a load.

For chemically set (epoxy/glue) anchors, an annual testing regime is to be undertaken. The tests shall be carried out in **tension** (refer to figure 9), perpendicular to the direction of the likely fall arrest load. On occasions, they may be carried out in shear – where this is the case it should be specified by a Structural Engineer.

TEST LOADS
As a general principle, the requirement for proof-load testing is to apply 50% of the design load for a minimum of 3 minutes (e.g. for a 15kN anchor, apply a 7.5kN).

The method will vary depending upon what style of anchor is being used. A summary of the various anchors and their fixing methods and environmental requirement for testing are listed as follows:

TABLE 2: Testing and / or Inspection requirements for anchors (Refer to Figure 4 - Anchor Types)

Refer to FIGURE 4	ANCHOR TYPE	COMMISSIONING TESTS OR INSPECTION
A	Anchor cast into concrete	• Proof load tested to 50% of rated capacity for 3 minutes once design strength of concrete is achieved. • Type test of anchor product.
A	Anchor through-bolted to concrete	• Visual inspection.
A	Anchor through bolted to masonry blockwork (excluding concrete)*	• Visual and / or proof load to engineers requirements.
A	Anchor drilled into concrete	• Proof load to 50% of rating
A	Anchor drilled into masonry blockwork	• Visual and / or proof load to engineers requirements.
B	Anchor bolted to steelwork – structural	• Commisioning test - tighten to torque rating spec by manufacturer • Ongoing - Visual inspection.
B	Anchor welded to structural steelwork	• Demonstrate welding to AS 1665 Category 2. • Load test to 50% in tension. • Non-destructive examination to AS1665 once installed.
C	Anchor bolted or riveted to steelwork – lightweight (purlins etc.)	• Visual inspection.
C	Anchor, through roof mount, not relying on dynamic action of roof	• Visual inspection
D	Anchor top fixed to roof sheet – these are ALL assumed to rely on dynamic or load spreading capabilities of roof to operate correctly	• Visual inspection
E, F, G, H	Anchor, portable incl. davit, tripod, cross beam, bridge and counterweighted	• Visual inspection or to manufacturer's requirements. • If the action of the device relies on a permanent part of the structure (i.e. Davit bases in floor of structure) load test to 50% in tension or to designer's specification.
G	Anchor, girder mount - this may be a clamp on girder mount or a girder trolley	• Visual inspection

2.2 Horizontal Lifelines and Rail Systems

2.2.1 System Configuration

Horizontal lifeline and horizontal rail systems have traditionally been designed in both fall arrest and fall restraint configurations. In the instance that a system is however installed on a steep roof, or if in fact the conditions change (e.g. a person falls through a skylight on a restraint-rated system, this represents a major hazard to the user's safety and it may not in fact arrest the person's fall).

For this reason, whether the system is being used for either restraint or fall arrest, it must always be designed for the worst case, being fall arrest. This therefore means a horizontal lifeline system must always be designed for fall arrest conditions and only those design requirements are recognised in this Industry Code document.

2.2.2 Types - Proprietary / Prescribed

There are two styles of permanent fall arrest lifeline or rail systems permitted for use on structures. The differences are explained below.

2.2.2.a Proprietary Systems – Horizontal Cable

A 'proprietary' horizontal cable system is one by which the fall arrest performance of any selected layout/design can be determined by using an engineering method or program to calculate loads using known values. The values have been verified by means of performance testing of prototypes over an adequately representative range of layout configurations. In other words, utilising a set of tested combinations of components, you can determine the performance capabilities of a specific lifeline design.

These configurations are also known as 'engineered' systems. They are comprised of flexible wire-rope cable lines with end anchorages and a series of by-passable intermediate brackets, such that the mobile attachment devices are capable of passing across the length of the system without the need for disconnection from the line. The system components and recommended installation configurations should be traceable to prototype or sample testing to AS/NZS 1891.2.

The systems are designed as a completed installation and must be installed by an accredited and competent installer, who has been trained by the manufacturer of the system.

2.2.2.b Proprietary Systems - Horizontal Rail

Horizontal rail systems generally comprise a steel or other metallic solid structural member (e.g. aluminium extrusion) along which one or more mobile attachment devices run, with each providing a travelling anchorage for connection of personal fall arrest equipment. The strength of the rail and its fixing to the supporting structure is determined by structural design calculation and testing.

2.2.2.c Prescribed Configuration Systems

A 'Prescribed' engineered system is a lifeline that has been designed by a rigger, engineer or other person with skills, that proposes the assembly of a series of components to produce a lifeline that has no known or tested capabilities. It relies on the combination of individual components with known strengths to comprise a solution.

Although the use of a Prescribed Configuration Systems as detailed in AS/NZS 1891.2 Supp1:2001 is deemed to be legitimate, this Industry Code does not recognise *Prescribed Systems* as being a suitable or a preferred option for consideration.

Extensive industry experience has shown that installers/sellers of these systems **DO NOT** take the required precautions to ensure the combination of components and their source are sufficient to provide the necessary safeguards (including the relevant margins of safety). They therefore do not provide the level of user safety and conformance with the Standards that Proprietary Systems offer.

In addition, the following elements are not automatically required or limited in a Prescribed system:

I) Use of intermediate brackets that allow mobile attachment devices to pass across them and remove the need to attach, detach and attach.
II) Restriction of the overall length of the horizontal lifeline.
III) Restriction of the span length of the horizontal lifeline.
IV) Restriction of the number of users of the horizontal lifeline.
V) Restriction of cable diameter, construction and material, stainless steel is not permitted.
VI) Line (system) energy absorbers are not permitted.
VII) System height cannot be less than 1.5 metres above the user's walkway.

Prescribed system design is therefore not recognised or covered by this Industry Code.

2.2.3 System Design / Layout

d) System Design Requirements

The following requirements shall be incorporated into the design of horizontal lifelines and horizontal rail systems including associated documentation where appropriate:

i) The system shall not allow the fall arrest loading exerted on a user's harness to exceed 6kN when the user is equipped with and is correctly using personal fall arrest equipment as specified in AS/NZS 1891.4;
ii) Calculation software that provides the end anchorage forces and line deflections when arresting a fall shall be based either directly on test results or on interpolation of test results in respect of span lengths, and interpolation or extrapolation in respect of overall line length;
iii) The components including terminations, cable and end anchorages are capable of supporting without failure a minimum force equal to or greater than twice the maximum fall arrest force in the system;
iv) End anchors are also required to be capable of supporting a force of 12kN at right angles to the axis of the cable in the direction of fall arrest;
v) For horizontal lifelines the minimum cable diameter shall be 8mm and shall be made of stainless steel or specialty low-stretch synthetic cable;
vi) Swaged terminations shall be made from the same material as the cable to avoid an adverse reaction with the material or the wire cable e.g. dissimilar metal corrosion or cracking;
vii) Intermediate brackets shall allow the horizontal lifeline to run freely through the aperture and to prevent damage to the cable;
viii) Intermediate brackets are to be capable of supporting a force of 12kN at right
ix) angles to the axis of the horizontal lifeline and in the direction of the fall and its arrest;
x) Mobile attachment devices shall either be impossible to remove from the horizontal lifeline or horizontal rail systems or shall be removable only by at least two consecutive deliberate manual actions;

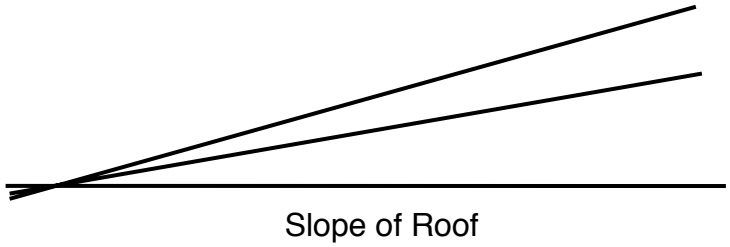
xi) Mobile attachment devices shall be capable of supporting a force or 15kN in the direction of intended loading without breaking and without deforming in a manner which permits inadvertent detachment from the horizontal lifeline or horizontal rail system;
xii) Calculation of safe fall clearances below the system at any point shall be based on the maximum deflection of the system at that point when arresting a fall, including the effects of personal and line energy absorber extension, the maximum height of a user, harness D-ring stretch plus a further clearance of at least 1.0 m as specified in AS/NZS 1891.4;
xiii) The system must be installed as per the recommendations and documented installation instructions provided by the system manufacturer;
xiv) The system must be installed by a competent person from a company that has been trained and approved by the system manufacturer;
xv) The use of components from multiple manufacturers in a system is not acceptable due to possible incompatibility and the likely event that they have not been tested together to demonstrate a known performance;
xvi) All system components shall meet or exceed the relevant requirements of AS/NZS 1891.2.

2.2.4 System Installation Criteria

The System Designer and System Installer of the horizontal lifeline and horizontal rail systems must consider the following prior to and during the installation.

1. The structural capacity of the material that the horizontal lifeline and horizontal rail systems will attach to.
2. The structure must be capable of supporting the design loads nominated by the system manufacturer for the specific installation as determined by the calculation software.
3. There is sufficient fall clearance.
4. The frequency of system use and number of users.
5. The operational environment, considering the effects on both performance and maintenance requirements.
6. The slope of the roof that the system will attach to and that the user will walk on without any levelled walkway will determine the type of system to be chosen:
    i. All systems must be designed for fall arrest forces regardless of the system type.
    ii. Consideration should be given to installing horizontal rail systems where the slope of the roof is greater than 10 degrees to eliminate system loading by the user which may cause system energy absorbers to deploy and intermediate brackets to deform as this will alter and reduce the system's fall arrest performance characteristics.
    iii. A roof with a slope of 15 degrees or greater is generally unsuitable for the installation of a horizontal lifeline.
    iv. A roof with a slope of 15 degrees or greater will be better suited to have a horizontal rail system installed.

Figure 16 - Slope of Roof from Horizontal



Slope of Roof

Over 15° - Fall Arrest Rail Systems

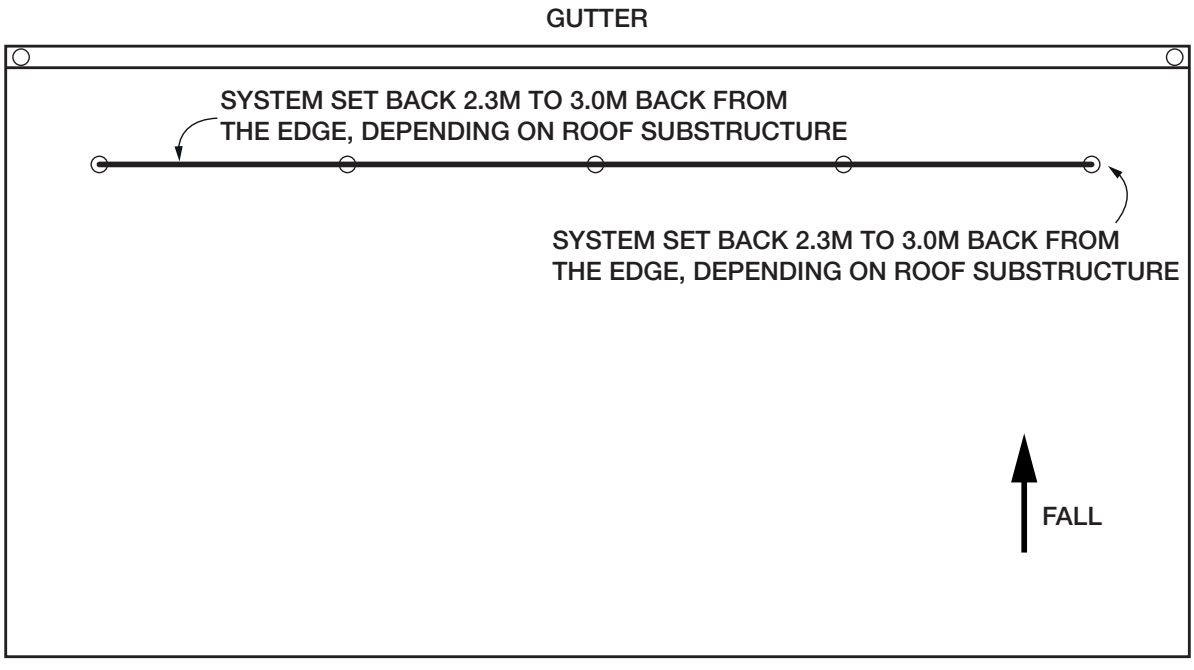
10° to 15° - Fall Arrest Cable and Rail Systems

0° to 10° - Restraint Technique and Fall Arrest Cable and Rail Systems Acceptable

NOTE: The slip resistant capacity of the surface will reduce the recommended angles

7. Consideration with regard to the surface that the user will walk on, such as:
    i. Slope;
    ii. Capacity;
    iii. Surface texture (in relation to worker stability/traction);
    iv. Weather conditions.
8. If the system is required to traverse skylights, a static line may be installed, accompanied by a section of walkway conforming to AS 1657 to provide safe access for the user over the skylight area(s).
9. If the user/ operator is required to traverse unprotected skylights, a safe means of entry and exit is required by means of a section of walkway complying to AS1657 which would include skylight protection means or guardrail to either side of the walkway.
10. The design of the system as specified by the system manufacturer.
11. The installation and use of the system as specified by the system manufacturer.
12. The installation and use of the system as per AS/NZS 1891.2 and AS/NZS 1891.4.
13. The provision of system data plates as per AS/NZS 1891.2 and AS/NZS 1891.4.

Figure 17 - System Installation on steel roof edge with flat profile

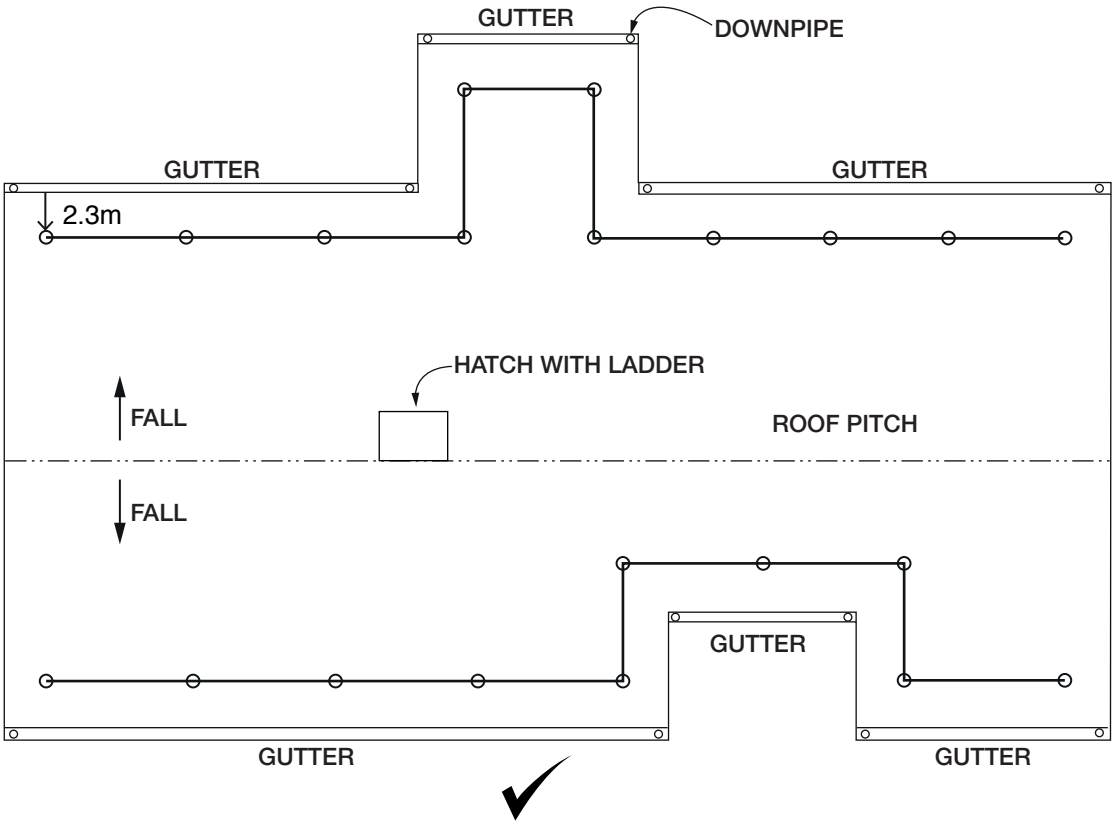


Tick : This system designed above gets a tick as the system is set back 2.3m from the edge of the roof, ensuring the use of a 2.0m lanyard and fully body harness means the person cannot fall over the leading edge. Access to the system is proposed from the gutter side, with a ladder bracket to secure the ladder to, and an anchor point located to ensure the user can connect to the system before transitioning onto the roof and connecting to the horizontal lifeline.

2.2.5 Horizontal System Spacing and Layout

The following image is a typical example of horizontal lifeline/rail layout principles. The list is not exhaustive – it is intended to provide general guidelines around product placement, such that safety can be maintained. All layout scenario drawings are in 'plan' view.

Figure 18 - System Installation on steel roof with relatively flat pitch



Tick : This system also gets a tick as the system is set back 2.3m from the edge of the roof, ensuring the use of a 2.0m lanyard and fully body harness means the person cannot fall over the leading edge. Even when carrying equipment and accessing the gutters for cleaning, under full restraint, the line prevents a person from reaching the edge. Additionally, access to the roof is from within the roof structure, further reducing the risk of a fall during system entry. Note that the anchors set at the ends of the system are also 2.3m back from the edge.

2.2.6 Product Selection

The selection of the correct horizontal lifeline or rail product will vary significantly with every location. For this reason, the knowledge of the site conditions and available structures is a critical step in assessing the most appropriate product.

Key assessment criteria in establishing the most relevant product for use is detailed in the Design guidelines shown in Section 1.7.

2.3 Vertical Lifelines and Rail Systems

2.3.1 System Configuration

A vertical lifeline system is designed for the safe access and egress of a person from a structure on a vertical plane. It is therefore always used in conjunction with a ladder, climbing pegs or other structure as the primary climbing method, with the vertical system being a secondary or support device for fall protection.

Vertical lifelines and rail systems have traditionally been designed in limited free-fall configurations. This is due to the nature of the short distance of the possible free fall in a vertical orientation (nominally maximum 600mm in line with AS/NZS 1891.3) when the connection device / traveller is located at the chest position.

There is always a potential for mis-use of a system if the user has not received adequate training. For example, the potential to connect an extra lanyard to a traveller device to increase working length is one such risk, preferably countered by the manufacturing process to remove the possibility of effective connection.

As a general rule, vertical climbing devices are for ascending and descending only. They are not intended for work positioning (ie to be suspended from) whilst performing work tasks. Utilising the climbing devices under load in a work positioning application also has the potential to semi-deploy the shock absorbing properties of the travelling device, affect line tension as well as create cable pull-through at the top tensioner.

2.3.2 Design / Layout

a) System Types and Description
Vertical lifelines and vertical rails are essentially a vertical flexible cable or rigid rail that is attached to a structure or ladder. A ‘Type 1 device’ as per AS/NZS 1891.3 is attached to the flexible cable or rigid rail and is connected directly to the user’s fall arrest harness via the frontal attachment point.

The user is permitted to ascend and descend the structure or ladder and in the event of a fall, the activating lever or cam of the Type 1 device automatically locks onto the flexible cable or rigid rail. The types of systems are described as follows:

(i) Proprietary Systems – Vertical Cable
A ‘proprietary’ vertical cable system is one by which the fall arrest performance of any selected layout/design can be determined by using an engineering method or program to calculate loads using known values. The values have been verified by means of performance testing of prototypes over an adequately representative range of layout configurations. In other words, utilising a set of tested combinations of components, you can determine the performance capabilities of a specific vertical lifeline design.

They are comprised of flexible wire rope lines with end anchorages and in some case (dependent on the system length) intermediate brackets (or cable guides allowing the removal of the cable), which allow a Type 1 device that is capable of passing across the length of the system without the need for disconnection from the line.

The system components and recommended installation configurations need to be traceable to prototype or sample testing. The systems are designed as a completed

installation and must be installed by a competent installer as trained and accredited by the system manufacturer.

(ii) Proprietary Systems – Vertical Rail
Vertical rail systems are designed in a similar method vertical lifelines. They typically comprise of a rigid rail manufactured from aluminium, steel or other metallic structural member with mounting brackets and end stops. A Type 1 traveller device can then be connected to that will run along the full length of the rigid rail.

The system components and recommended installation configurations need to be traceable to prototype or sample testing.

Preferably, the systems are designed as a completed installation and must be installed by a competent installer as trained and accredited by the system manufacturer.

b) System Design Requirements
The following requirements shall be incorporated into the design of vertical lifelines and vertical rail systems including associated documentation where appropriate:

i) The system shall not allow the fall arrest loading exerted on a user's harness to exceed 6kN when the user is equipped with and is correctly using personal fall arrest equipment as specified in AS/NZS 1891.4.

ii) Methods or programs for the prediction or calculation of end anchorage or mounting bracket forces when arresting a fall shall be based directly on test results in respect of the number or users on the system.

iii) For vertical lifelines the minimum wire cable diameter shall be 8mm and shall be made either from stainless steel or galvanised steel.

iv) Swaged terminations shall be made from the same material as the cable or from a metallic material not known to cause an adverse reaction with the material of the wire cable e.g. dissimilar metal corrosion or cracking.

v) The number of users on the vertical flexible cable or rigid rail is determined by system manufacturer and the structure or ladder to which the system is attached.

vi) For a single user on a vertical **lifeline** system, the components including terminations, cable and end anchorages are capable of supporting without failure a minimum static force of 15kN.

vii) For multiple users on a vertical **lifeline** system, the components including terminations, cable and end anchorages are capable of supporting without failure the minimum static force as recommended by the system manufacturer, this force will be greater than 15kN

viii) For a single user on a vertical **rail** system, the components including terminations, cable and end anchorages are capable of supporting without failure a minimum static force of 15kN.

ix) For multiple users on a vertical **rail** system, the components including terminations, cable and end anchorages are capable of supporting without failure the minimum static force as recommended by the system manufacturer, this force will be greater than 15kN.

x) If the Type 1 device is designed to be removed from the vertical lifeline or vertical rail system it shall be so designed that it can only be removed by at least two consecutive deliberate manual actions.

xi) The Type 1 device shall be capable of supporting a force or 15kN in the direction of intended

loading without breaking and without deforming in a manner which permits inadvertent detachment from the vertical lifeline or vertical rail system.

xii) Vertical rail systems shall be fitted with end stops at the top and bottom of the system to prevent the Type 1 device from running off the rail.

xiii) Calculation of safe clearances shall be based on the information supplied by the system manufacturer and AS/NZS 1891.4.

xiv) The system must be installed as per the recommendations and documented installation instructions provided by the system manufacturer.

xv) The system must be installed by a competent person as trained and accredited by the system manufacturer.

xvi) The use of components from multiple manufacturers in a system is not acceptable due to possible incompatibility and the likely event that they have not been tested together to demonstrate a known performance.

xvii) All system components shall meet or exceed the relevant requirements of AS/NZS 1891.3.

xviii) Safe Work Australia Code of Practice – Managing the Risk of Falls at the Workplace states:

i. Ladder cages in fixed ladders do not stop a fall but simply funnel a fall and, in some cases, more injuries can occur from striking the protective back guards on the way down. The cages may also hinder rescues. Therefore, fixed ladders with angles exceeding 75 degrees to the horizontal should be fitted with a permanent or temporary fall-arrest system (anchorage lines or rails).

ii. The preferred angle for a rung ladder to be installed is between 70° and 75° from horizontal.

c) System Configuration

Vertical lifeline and vertical rail systems are:

i) Classified as a Limited Free Fall system as per AS/NZS 1891.4

ii) The Type 1 device is attached to the frontal attachment point of the user's harness and that the total assembly is a maximum length of 300mm.

iii) The fall arrest equipment used shall limit the user's free fall to less than 600mm.

iv) Designed to be installed vertical or at an angle nominated by the system manufacturer off true vertical or off true horizontal. (AS 1657 nominates the preferred angle for a rung ladder to be installed is between 70° and 75° from horizontal).

v) Designed for single users unless approved by the system manufacturer for multiple users.

vi) Cannot be used for work positioning purposes.

d) Lifeline / Rail Positioning

Systems Designers must evaluate every vertical line installation and consider the best location for the cable to run. There are essentially 3 options on where to locate the cable: at the middle line of the ladder, off to either side of the middle line, or next to either ladder stile. There is no specific or correct answer as each circumstance is unique. However the key considerations around positioning of the system are:

i) Strength of the ladder – is it designed to accept limited free-fall or fall arrest loads?

ii) Construction material of the ladder – steel vs aluminium vs fibreglass. Each material has strength properties that need to be determined before a system can be fitted;

iii) Length of the distance between the traveller and the lifeline/rail – a maximum of 600mm free-fall is allowed for a system to be defined as limited fall (meaning the lanyard/shock absorber can have a 300mm maximum length).

iv) Width of the ladder – if the system is centrally located on the ladder, can a person wearing boots climb without impediment? Ideally clearance of around 150-250mm should be available.

v) The side of access and egress, particularly for staggered ladder systems.

Contact the manufacturer or installer to determine the best solution before installation.

2.3.3 Product Selection

The selection of the correct vertical lifeline or rail product will vary significantly with every location. For this reason, the knowledge of the site conditions and available structures is a critical step in assessing the most appropriate product.

Key assessment criteria in establishing the most relevant product for use is detailed in the Design guidelines shown in Section 1.7.

Appendices

Appendix A - Definitions

1. Batch Number
A permanent alpha/numerical marking on an item tracing the materials and item to the source materials at production.

2. Certifying Body
An independent, third party organisation that has overseen and/or reviewed the testing of a product in accordance with a prescribed Standard and verified its performance against the entire testing regime of that Standard to confirm the product can be marked with a certification mark.

3. Certified Product
A product that has been certified by an Certifying Body as passing all the prescribed manufacturing and performance (type) tests outlined in a given Standard and as such carries a mark of certification by the Certifying Body as being a verification of that process.

4. Competent Person
A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to correctly perform a specified task.

5. Compliance Placards
An information plate that is located at the entry to a height safety system (including vertical or horizontal lifeline or anchor system installations) that provides all required information regarding the system rating and whether it is currently in service.

6. Data Plate
A data plate is a tag attached to an individual lifeline, rail system or anchor that provides all required information regarding the product rating and whether it is currently in service.

7. Diversion Anchor
A secondary anchor used to connect a lifeline using a karabiner to reduce/remove the risk of a pendulum fall.

8. Engineer - Structural
A person who is eligible for Corporate Membership of Engineers Australia or the Institute of Professional Engineers, New Zealand and who has appropriate experience and competence to assess the integrity of a building or structure for the purpose of supporting the loads imposed by anchorage points.

9. Fall Arrest System
Personal fall protection system for work at a height by which a fall is intended to be arrested to prevent the collision of the user with the ground or structure.

10. Friction Anchor (fixing)
An anchor fixing drilled into a concrete or masonry substrate and held in place via a drop-in or expanding anchor that relies on friction to remain secure.

11. Glued-in Anchor (fixing)
An anchor fixing drilled into a concrete or masonry substrate and held in place via an epoxy filler that sets before the anchor is commissioned.

12. Horizontal Lifeline or Horizontal Rail
A linear anchor which allow users of fall arrest equipment the flexibility of lateral movement, without having to disconnect from the anchorage.

13. Installation Certification
A product installation that has been certified as meeting the requirements of the Manufacturer's installation instructions in order to be able to perform to the specified design and use requirements.

14. Installation Inspection
The procedure by which a competent person (Installation Inspector) assesses the completed anchor installation as to its compliance with the Standard, relevant Code of Practice, manufacturers' installations instructions and suitability for ongoing use by an end user such that their safety is assured.

15. Manufacturer
An entity that manufactures products specifically designed for fall protection, designed to comply with Australian and New Zealand Standards.

16. Permanent Anchor
An anchor point, for attachment of a fall arrest lanyard or lifeline, installed on a building or structure, intended to remain in place and be used at regular intervals by any qualified persons.

17. Portable Anchor
An anchor that by virtue of its size and weight can be placed temporarily on a structure and retain a load rating the equivalent of a fall arrest load without moving on the surface (example – free standing weights).

18. Prescribed System
Refers to a series of components provided from multiple sources and deemed suitable to be used together by the installation company for creating a permanent horizontal or vertical lifeline system. Prescribed systems are not required to be tested, but only be signed off by a Competent Person. Given the lack of testing accountability by virtue of their design, for this reason they are not recommended for use under this Industry Code.

19. Proprietary System
A proprietary system in this Code refers to a set of components provided by a single manufacturer that are assembled together in order to create a permanent horizontal or vertical lifeline or rail system. A product certified to AS/NZS 1891.2 is automatically recognised as a Proprietary System.

20. Qualified Installer
A person who has been through defined training courses and passed the testing process sufficient to demonstrate their competency at installing a fall protection system to the Manufacturer's defined requirements.

21. Re-certification Process
A periodic review of an anchor point or lifeline system and the verification of its compliance with the original Installation Certification by a Competent Person.

22. Restraint Technique System
Control on a person's movement by use of a fall arrest anchor or lifeline with the use a fixed length lanyard or other adjustable component that physically prevent the user from reaching an area where a fall can occur.

23. Rope Access
Techniques using ropes, normally incorporating two separately secured systems, one as a primary means of access and the other as back-up security. The system of work is used with a harness in combination with other devices, for getting to and from the place of work and for work positioning. This work should be undertaken with the oversight of a relevant trades association, Level 3 'Supervisor level' qualification.

24. Screw-in Anchor (concrete or masonry) (fixing)
An anchor fixing drilled into a concrete or masonry substrate and held in place via coarse threads on the body of the anchor, which cut into the substrate to enable the anchor to grip. A screw-in anchor is deemed to be a friction anchor with regards to installation orientation and inspection / testing requirements.

25. Serial Number
A unique permanent alpha/numerical marking on an item that identifies a system or item.

26. Shall
'Shall' indicates that a requirement is mandatory.

27. Should
'Should' indicates that a requirement is recommended.

28. Standard
An Australian and New Zealand Standard that has been published by Standards Australia, following the prescribed drafting and public review process.

29. System Designer
A Competent Person who has the responsibility to design an access system incorporating anchors or lifeline systems, or a combination of both, utilising the Industry Code, Codes of Practice, Standards and Manufacturer's instructions such that the safety of the users of the system can be assured.

30. Temporary Anchor
An anchor point, for attachment of a fall arrest lanyard or lifeline, installed or used on a building or structure that can be removed after use. (examples – tie-off adaptor, clamp)

31. Through-fix Anchor
An anchor that is fixed through steel, block-work, masonry or concrete and is secured on the reverse operating side by a sandwich plate and locking nut.

32. Top fixed Anchor

An anchor point, for attachment of a fall arrest lanyard or lifeline, used on a metal deck roof. It may be fixed to the roof sheeting or structure and may also be fixed through to the purlin, on the underside of the roof sheeting.

33. Undercut Anchor (fixing)

An anchor fixing drilled into a concrete or masonry substrate and held in place via a drop-in expanding anchor that relies on friction, but that also has a feature that allows it to grip a ridge cut into the substrate. An undercut anchor is deemed to be a friction anchor with regards to installation orientation and inspection / testing requirements.

34. Vertical Lifeline or Vertical Rail

Are vertical anchorages which allow users of fall arrest equipment the flexibility of vertical movement, without having to disconnect from the anchorage.

35. Workplace Manager

A Person Conducting a Business or Undertaking (PCBU) or a person who is in charge of a site on which work activity is being completed.

Appendix B - Referenced Standards, Codes and Documents

Standard/ Document	How it relates
AS/NZS 1891.1	This is the manufacturing standard for harness and lanyards. There are no specific requirements in this standard relating to anchor systems.
AS/NZS 1891.2	This standard covers horizontal lifelines and life rails. Note the standard is in 3 parts – Proprietary systems - covers engineered systems as designed by suppliers of complete systems. The second part (Prescribed Systems) is a design developed by the drafting committee after extensive testing – it offers “off the shelf” designs of HLL’s providing they are installed strictly in compliance with the design. Beam and trolley systems are covered in the third section.
AS/NZS 1891.3	This standard covers vertical rope systems (both metal and fibre) and track/rail systems. It also covers inertia reel style devices.
AS/NZS 1891.4	This document covers selection, use and maintenance for harness based working at height equipment. In addition, this standard also sets out the minimum strength requirements for anchor points for single person, two person and static line end anchorages.
AS/NZS 5532	This document covers single point anchors (for connection of one or two persons) including davits, tripods, beam style anchors and counterweighted systems. This standard is a manufacturing only standard that proposes testing methods for anchors. For required site specific applications, refer to the information provided in this Industry Code to comprise an entire installation.
AS/NZS 4488, parts 1 & 2	These documents cover rope access and part 2, which detail, the selection and safe use of equipment, sets out some parameters for anchor design.
AS 1657	The standard for the design, manufacture, installation of fixed ladders, platforms, walkways, guard-railing, stairways, used for equipment to gain safe access and egress to and from anchor systems.
IS0 17020	Standard on inspection bodies and what needs to be dealt with in an inspection of equipment. This is the standard to which NATA (National Association of Testing Authorities) accredits inspectors and certifiers of equipment.
IS0 17025	Testing standard for inspection companies covering type testing, in situ testing and load testing of anchors. This is the standard to which NATA (National Association of Testing Authorities) organizations that test equipment.
IRATA ICOP	Sections: 1.3, 2.7.8.2.2, 2.7.8.2.3, 2.8.8.3.1, 2.7.9.6, 2.11.6.1, 2.11.2.8 - 2.11.2.10 et all, Annex F et al, Annex L Section 2.6.7.1
ARAA Code	Permanent Anchors for Rope Access Use, version 1e - 22/10/2007
ISO 22846	International Standard for Rope Access - Parts 1 & 2

Appendix C - Anchor System Design Considerations (Extracts from AS/NZS 5532:2013)

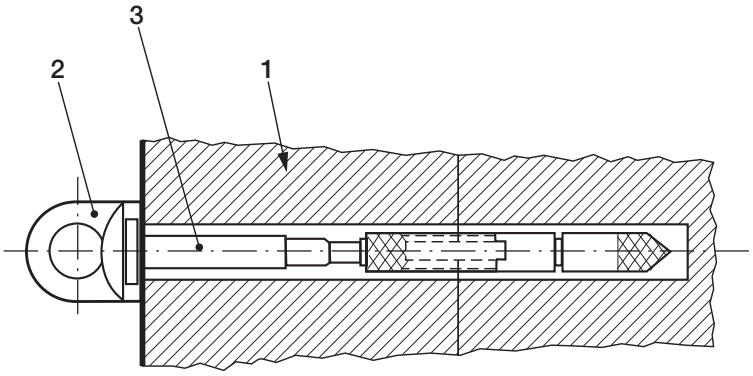
The following extracts from the manufacturer's standards AS/NZS5532 provide some guidance on glued-in (chemical) anchor installation information for rope access applications. AS/NZS 5532 calls for the following minimum ratings of anchor points – note they may be rated for one person or two:

> *Single point anchor devices may be either rated for limited free-fall arrest or fall arrest.*
>
> *Limited free-fall arrest anchors for single persons shall be rated at 12 kN Free-fall arrest rated anchors for single persons shall be rated at 15 kN See Clause 5.2.*
>
> *Anchors for two persons shall be rated in the following manner:*
> *(a) Limited free-fall arrest two person anchor: 18 kN (12 kN + 6 kN = 18 kN).*
> *(b) Free-fall arrest two person anchor: 21 kN (15 kN + 6 kN = 21 kN).*
>
> *As far as practicable, all single point anchorages should be rated for fall arrest, even though this Clause specifies a lesser strength for some categories.*
>
> *The anchor device shall be designed to withstand a force equal to the rated capacity in all directions in which a force could be applied during a fall arrest. See Figure 8 for potential loading directions.*

Rope Access anchors are to be rated at a minimum of 12 kN ultimate (limited free-fall), however the anchors should be rated at 15kN whenever possible so they are suitable also for use in fall arrest. Where both the working rope and the backup rope is intended to be connected to the same anchor, it is also preferable that the anchor be rated at 15 kN ultimate.

Maximum allowed angle 20 degrees from the horizontal – no axial tension (direct pull-out) allowed – Note these drilled-in anchors require regular testing also, and as such, become a potentially expensive option. (If the anchor is to be used in tension, it shall only be through bolted – i.e. **NOT friction or glued in.**

Figure 19: Typical eyebolt used for drilled in (friction/glued in/screw in) installation



(b) Drilled in anchor

Legend

1 Structure
2 Personal attachment point
3 Anchor device

Appendix D - Responsibilities

This appendix is included to provide a detailed summary of the responsibilities of the various roles to be undertaken in the development through to commissioning and use of a safety system.

D1 System Designer and Engineer

System Designer – is responsible for documenting the layout and positioning of the anchorages or lifeline, public protection and rescue considerations. They also define the system specification and are responsible for obtaining manufacturer endorsement for their proposed layout/design. In some cases, this may be by way of a calculation program defining a system design load. In other cases, the system designer may access a product that offers design parameters from which a suitable design can be verified as able to perform to the design requirement (such as instruction manuals, technical literature).

Engineer – is responsible for assessment of the underlying substrate and its suitability to sustain structural loads.

D2 System Installer / Certifier

Qualified Installer – installs the product in the correct location, following the manufacturer's installation instructions, design layout and the engineer's structural requirements.

Installation Certification – ensures that the engineer, system designer and manufacturer's requirements are met for the particular installation when first installed.

Installation Inspector/Re-certifier – conducts routine inspections and maintenance of the system. This requires following the manufacturer's certification documents and should be accompanied by qualifications following Standards such as ISO17025 testing requirements and ISO17020 requirements for in-service inspection. The inspector ensures that the system is suitable for ongoing use based on the manufacturer's specifications.

The installation team shall comprise individuals who demonstrate competency in the installation of anchorage points and/or lifeline systems (both permanent and temporary), relevant to the works to be carried out. A team shall have installers that are fully trained in all aspects of the works to maintain their safety and the safety of others. They must also be able to demonstrate their rescue plan in the event of an emergency.

Every installer shall be suitably qualified and competent to work safely at heights, including the use of temporary systems for their own personal safety during the installation. These Qualified Installers shall provide a system for their own rescue, if there is a likelihood of them falling whilst installing the anchors or systems.

The team must also have individuals within it that have the skills to operate tools and testing equipment and shall be able to demonstrate they can safely complete the works (herein identified as Qualified Installers).

The Workplace Manager has the responsibility to ensure that the installers performing the works required are capable of performing the work in a safe method.

Some examples of the verification of this competency could be as follows:

(1) Evidence of successful training completion of the Qualified Installer by the Manufacturer of the products being installed
(2) Work Safely at Heights training certificates, including rescue
(3) White Card / Construction induction certificates
(4) A level 3 rope access technician with a qualification from a relevant trade association
(5) Building licenses
(6) Other forms of relevant qualifications

The installation team shall understand all relevant aspects of the access equipment and anchors being installed and of any fixings, adhesives or compounds that may require special treatment to ensure they operate satisfactorily. Specialised product installation training shall be provided to the installers by the manufacturer. The manufacturer shall deem the installer competent in the installation of their product. Refer to Appendix E to view the minimum competencies for Qualified Installers.

A core component of the verification process that is often missed is assessing the installer for their **insurance coverage**. A Qualified Installer should provide a copy of these documents for the Workplace Manager prior to any works being completed:

A. Certificate of Currency for Public Liability Insurance (typically for $20M or greater);
B. Workers Compensation Insurance;
C. Professional Indemnity Insurance.

D3 System Workplace Manager

The person who is in control of the workplace is referred to in this document as the Workplace Manager. The Workplace Manager may include the building manager, body corporate, the commercial tenant, the facility manager, the property owner or employer.

The Workplace Manager has a duty to ensure that the design, installation, testing (where required), certification, documentation and handover are carried out correctly. This includes ensuring that personnel are competent to carry out the physical works and that the correct process is followed in undertaking the design and installation.

Further, safety while the works are being carried out must be ensured at all times. This not only extends to the staff of the work place, but is for all contractors who are employed to complete and certify the installation.

In ensuring the safety of persons and the works, the competencies to operate equipment including any access equipment, certifications (e.g. EWP) must be available and maintained.

D4 System Users

The responsibilities of system users are primarily around managing the safe access of the system by themselves and others. In other words, the user has a responsibility to ensure they have the appropriate:

(1) Training in system use and are familiar with system hazards and operational functions;
(2) Have the relevant working at height qualifications (if required) to undertake system access;
(3) Have in place a safe work method statement (SWMS), rescue plan and all PPE equipment required to undertake the works planned to to be completed;
(4) That all others working with them can equally demonstrate their conformance with these requirements;
(5) Have the the technical skills, knowledge and training to perform the rescue if required.

D5 System Inspector / Re-certifier

D5.1 Anchor and System Marking/Labelling using a Compliance Placard

All anchor points should be identified with a weather-proof data tag/plate (preferred), or be identified on an anchor/rigging plan positioned at the entry point to the system (least preferred - refer to Section 1.10.1.3).

The anchor tag should have the following information:

1. An indelible serial number or batch number.
2. The manufacturer and supplier's name, trade mark or other means of identification.
3. The manufacturer's batch number or serial number of the component.
4. The product rating, in kN, or capacity (e.g. single person/limited free-fall).
5. The characters in the identification mark shall be readable and discernible after installation.
6. Each anchor shall have an attached label or marking to identify it for personnel attachment only.

The labelling shall be legible and durable taking account of likely weather conditions.

Following any incident such as a fall, affected anchors shall be tagged and withdrawn from service until an engineering assessment/inspection has been carried out and the anchor replaced, repaired or re-certified.

D5.2 On-Site Testing (also refer to Section 2.1.5 and Appendix E)

Two (2) different types of tests may be required, these being:

1. Proof load test
2. Verification test

Proof load test – The proof load test is used to prove that the connection to the substrate is adequate. This test shall be performed on anchors in masonry materials and may be prescribed by the System Designer (Engineer) for other types of anchors.

Proof loads are performed in axial tension (direct pull). On-going proof-loading (i.e. after initial installation) may require removal of the anchors for inspection for corrosion.

Products that shall be proof loaded include glued in anchors and friction type anchors.

- The proof load applied shall be 50% of the minimum anchor design load (e.g. apply 7.5kN to an anchor rated to 15kN and held for a period of 3 minutes without failure), unless the manufacturers requirements say otherwise.
- Pass / fail criteria – no visible permanent deflection/deformation or failure to hold the load.
- Proof load testing shall also be carried out for fasteners that attach components of a lifeline system to masonry materials.
- Proof load testing may also be required by the lifeline manufacturer of the termination components to the cable.

Verification test – No proof load test is required, a visual inspection is performed to confirm the installation is as per the manufacturer's recommendations/specifications. The verification test includes the anchor or lifeline and the substrate. A typical example of a verification test would be a top fixed anchor attached to roof sheeting.

Installation of anchors should only be performed by individuals that have been trained and accredited by the manufacturer to be competent to complete this task. Verification of this can be by way of a certificate issued by the manufacturer to the Certified Installer / Re-Certifier, detailing the validity of their training in that system and anchor type.

Appendix E - Core Competencies

This appendix is included to provide a detailed summary of the competencies and skill sets of the various roles to be undertaken in the development through to commissioning and use of a safety system.

E1 System Designer

The System Designer ensures the works are safe to install and are suitable for the intended end use (e.g. that the anchor or lifeline system will actually work for the needs of the users). Where possible the anchor or lifeline system should be designed for restraint technique use.

The System Designer shall ensure:

- That the installation can be carried out in a safe manner so as not to place the installers, users or public at risk
- That the structure is assessed prior to the installation to determine if engineering assistance is required
- That suitable drawings, specifications and other documentation is produced to ensure site personnel understand how the installation is to be carried out
- That suitable materials (anchors, lifeline components, fixings , paints, sealants etc.) are specified to ensure suitability for use, safety and durability
- An ability to assess the structure against design specifications and read drawings.
- To ensure that the installation is suitable for use, have an understanding of how to use a harness based system of work and concepts such as
    - Ensuring there is always safe passage to, from and around anchor and lifeline installation. This may require the addition of AS 1657 solutions
    - Ensuring that elements of the building such as glass façade elements are protected and ensure that operators and their equipment are not placed at risk by these elements
    - Ensure that anchors and lifelines are not placed too close to fall potentials such as roof edges
    - Ensuring there are no pendulum falls in harness based work,
    - Documenting how a person could be rescued from the system
    - Limiting the ability of a person to fall over an edge,
    - Where a potential of a fall over an edge could occur, to make some allowance for this thus preventing lanyard damage
    - How to deal with surrounding hazards such as Laserlite, skylights, asbestos roofing, and plant in the way of anchors or lanyard runs etc.
    - Limiting potential fall distances.
    - How to assess and deal with steep inclines such as steep roofs.

Design experience:

Demonstrate an ability to design a system that protects a person whilst they are connected to the system carrying out particular tasks.

- Understanding the tasks to be performed, and the purpose of the system. Note for rope access works the designer may need to seek expert guidance to assist in this task
- Access to the system and access between levels.
- Understand this Industry Code, relevant Australian & New Zealand Standards, work instructions and manufacturer's instructions
- An understanding of the range of suitable products in the marketplace.
- Demonstrate ability to understand how the products are installed and be able to effectively transmit this information to site personnel.

Demonstrate an ability to carry out the design work by way of demonstrating hours under supervision by way of a log book or some other way such as demonstration of experience in the area by way of previous successful projects.

The work experience recorded shall be related to the task, and related activities.
In the case of a rope access installation, due to additional complexity, demonstrate specific experience in this area.

Demonstration of suitable experience is suggested as follows:
*Designing at least 5 complex systems. There should be regular assessment of the persons competency by instruction and observation by the Workplace Manager.

To ensure that the designer has suitable experience, the following minimum qualifications are expected to be held by this person:

- Safe working at heights or equivalent rope access course (AS/NZS 1891.4, Appendix E, Level 3 ARAA or IRATA), the choice of which should be relevant to the system design/function;
- Manufacturer's training on product, fixing, structure and design layout.

Engineer
Eligible for membership of Engineers Australia and has experience to
assess the structure of the building (See definition in Appendix A)

- A practical working knowledge of the relevant Codes of Practice and Standards
- A demonstrated history in systems and anchor design and layout
- A familiarity with manufacturer design and strength requirements for anchors and lifelines

E2 System Installer / Certifier

Certifier competency is a combination of training, education and experience covering:

1. Knowledge of relevant standards
2. Ability to assess the installed system and the substrate.

A certifier should have at least 3 years relevant experience of a combination of system design, installation and use of installed systems, unless a person can demonstrate equivalent relevant experience.

As pointed out previously in this document the term "installation" can mean as little as drilling holes or as much as undertaking a wide range of engineering, testing and certification functions.

To be competent, Qualified Installers shall demonstrate the ability to:

- Use the correct tools
- Work in a safe manner so as not to place themselves or the public at risk
- A practical working knowledge of Australian & New Zealand Standards, work instructions and manufacturer's instructions
- Demonstrate ability to install equipment and document this installation process
- An ability to assess the structure against design specifications and read drawings.

Minimum training requirements:

- Safe working at heights, including rescue (AS/NZS 1891.4, Appendix E)
- Construction induction training
- Manufacturers training on installing specific product
- Use of specific access equipment that may be required – e.g. Elevating work platform

Installation experience:
Installers should work under the supervision of an experienced operator who should be able to demonstrate a minimum level of experience in relevant works.

For rope access operatives, this experience can be demonstrated through the use of a log book as it is required to keep records of hours being spent. Non-rope access staff may be able to utilise alternative means to demonstrate/record hours being spent installing systems.

The Workplace Manager should ensure that senior installation personnel have a recommended relevant competency of at least 50 hours general installation works, with 10 hours directly related to each product that is to be installed. There should be regular assessment of the person's competency by instruction and observation. This experience must include working in similar environments with the specific product.

As the senior installer will generally be supervising other personnel, it must be ensured that the skills held are suitable to do this.

Demonstrate experience in their ability to do the work by way of recording hours spent on the project under someone else's supervision by way of a log book, or similar process.

The work experience recorded shall be related to the task and related activities.

The installer shall be trained and accredited by the manufacturer of the anchor or lifeline in the specific product installation with training, updated or refreshed every 24 months to take into account changes in Australian standards and product development. Training shall be specific to that product and the manufacturer shall certify the installer, designer and certifier as competent to perform those tasks.

Initial certifier of anchor or lifeline systems
This person has the responsibility to review and inspect the final installed system and documentation and to provide a certificate of conformance to this Industry Code for the entire system, which includes documentation.
This person shall demonstrate competency as follows:

- A practical working knowledge of the relevant Codes of Practice & Standards
- An ability to assess the structure against design specifications and read drawings.
- Common installation errors
- That the anchor and lifeline is installed to the designer
- Structural requirements, and the manufacturer's installation instructions.
- The ability to overview testing (where necessary) and verify pass / fail criteria
- An understanding of suitable layouts and tasks appropriate for the works to be completed.

The certifier should possess the following minimum training/qualifications:

- Safe working at heights or equivalent rope access course (AS/NZS 1891.4 Appendix E, Level 3 ARAA or IRATA), the choice of which should be relevant to the system design/ function;
- Manufacturer's training and accreditation on product, fixing, structure and design layout.

Certifier's experience:
The certifier should demonstrate at least 2 years relevant industry experience (e.g. . Designing, installing or using anchor based systems systems)

E3 System Workplace Manager

E3.1 After the Installation

After commissioning of the works, the system is handed over to the Workplace Manager.

1. Workplace Manager Guidelines

Once the anchor or lifeline installation has been handed over, the Workplace Manager has the responsibility to ensure that:

- Handover documents are retained and updated as required
- Procedures are developed to ensure that only persons trained in use of the installation are allowed to use the system
- User information is provided to system users.
- A reasonable amount of supervision and training is provided to ensure that the systems are used correctly.
- That there are adequate rescue plans in place, which are practiced.
- The system is used correctly, by suitably trained personnel
- The system is maintained and inspected in a timely fashion in accordance with the instructions set out in the Inspection and Recertification guidelines (refer to Section 1.11).

In addition to the Workplace Manager, other persons may also have concurrent responsibilities in regard to the proper use and maintenance of the anchor or lifeline installation (e.g. Subcontract Company who intends to use the installation).

2. Inspection & Recertification

This involves the process of conducting routine compliance inspections for all installations in the control of the Workplace Manager. They should seek to:

- Ensure that inspections are performed in a timely fashion.
- That the manufacturer's recommendation/specification are adhered too.
- Prior to and during use of the system, the user should conduct ongoing inspections to ensure that any damage is identified and reported to the Workplace Manager.
- The system should not be allowed to be used if it is not current in regard to inspection and is not bearing markings indicating currency.
- Each state has its own requirements for the frequency of anchor and lifeline inspection. These requirements are prescribed in state based WH&S Regulations, Codes of Practice or industry specific guidance material.
- Acts, Regulations and Codes of practise are higher order legislation than Australian Standards, and as such, when those documents prescribe how often anchors and lifelines are inspected, takes priority and precedence over the requirements Australian Standards or this document.

3. Verification on Anchor & System Design & Installation

The Workplace Manager should ensure that they have documented evidence of the adequacy of the anchors and lifeline systems i.e. that the anchor complies with the strength requirements of AS/NZS 1891.4, certification to AS/NZS 5532 or AS/NZS 1891.2.

Any review shall also include the adequacy of the substrate's capacity. Manufacturer's should also be able to provide documented evidence (e.g. test certificates) that the product or system has compatibility with the structure or roof profile in order to prove a system is capably of operating within the strength requirements.

Where a system or anchor is found to be deficient:

- Tag the anchor system out of use
- Upgrade the system to meet minimum requirements, or
- Remove the system and replace with one meeting the current requirements.

4. Uncertified / Non Verified Systems and Anchors

There may be an occasion when a Workplace Manager becomes aware of an anchor or lifeline installation on a new premises that they are unsure about. Even if it does have a compliance plate and is within service, they should take the following steps:

(1) Until further notice, check the system out of service until an inspection can be performed;
(2) Contact the last inspection company to review their documentation and provide copies of the latest data;
(3) If non-contactable, contact the installation company to determine the details of the system installation if available;
(4) If non-contactable, contact the manufacturer to determine the details of the system installation if available. They can arrange for a suitably qualified installer to visit the site and conduct an inspection;
(5) Only return the system to service when you have satisfied yourself the system is fit for use.

E4 System Users

The core competencies of system users are primarily around managing the safe access of the system by themselves and others. In other words, the user has a personal responsibility to ensure they have the appropriate skill sets. The Workplace Manager should set a standard for system access and entry, including but not limited to:

(1) Training/knowledge in system use and that users are familiar with the specific system hazards on the location and how the risks can be managed;
(2) Have the relevant working at height qualifications (if required) to undertake system access;
(3) Have knowledge of equipment, processes and the ability to implement a rescue plan in the event of an emergency whilst utilising the safety system;
(4) That all others working with the system can demonstrate their conformance with these requirements.

In the event they fall short of these requirements, the user should obtain information from the Workplace Manager in order to ensure they can operate safely, or obtain the qualifications required to provide them with the competencies for safe system access.

E5 System Inspector / Re-certifier
Inspector of anchor or lifeline systems (Referred to as a "Re-certifier")

Shall demonstrate competency as follows:
- A practical working knowledge of the relevant and Codes of Practice and Standards
- An ability to identify defects and deterioration in anchor installations and to record the findings.
- Ability to assess changes to the structure that affect the system being used as intended.
- Ability to use an anchor or lifeline based system.
- Ability to review the system documentation.
- Ability to make judgement assessments where existing anchor or lifeline system may not have all expected documentation and labelling information available.
- Be a manufacturer accredited/certified inspector for each particular system that they are re-certifying.

It is expected that the re-certifier will hold the following minimum training/qualifications:
- Safe working at heights or equivalent rope access course (AS/NZS 1891.4 Appendix E, Level 3 ARAA, IRATA), the choice of which should be relevant to the system design/function;
- Manufacturer's training on product, fixing, structure and design layout.

Re-Certifier's experience:
The re-certifier should demonstrate at least 1 year relevant industry experience (e.g. a combination of designing, installing, inspecting or using anchor based systems systems).

APPENDIX F - Checklists

This appendix is included to provide samples of Checklists that can be used by the different roles to be utilised in the development through to commissioning and use of a safety system.

These samples are not prescriptive, but general guidelines.

Please refer to manufacturer-specific checklists for installations in addition to those provided for guidance on inspection.

COMPLIANCE STATEMENT FOR PERMANENT ANCHOR INSTALLATION

(To be completed by the initial certifier, with date for recertification, strength rating, number of users and unique identifier included)

	Contact details of company Address Email Phone Fax	
1.	System commissioning date	
2.	Required frequency of inspection	(Specify date - Every x months)
3.	Testing, inspection requirements:	(Specify testing e.g. Load test or visual)
4.	Location of the system	(For a complex systems, attach a sketch of layout)
5.	Product description and serial numbers	(Insert serial numbers)

By signing this document, the certifier confirms that all anchors and systems have been labelled in accordance with sound labelling principles. All permanent anchor points should be marked with the following information:

- Manufacturer's/installer's contact
- Load rating and direction.
- Specific use if not also suited as a fall protection anchor (min. 15 kN ultimate)
- Most recent inspection/service date

This information should, where practical, be fixed to or at each anchor, but may in some cases be fitted at one location such as the access door to a roof. All anchors should preferably be marked with at least a serial No or batch No to enable traceability of individual anchors.

Attach sketch / plan of anchor layout and system manual.

Company

NAME & CONTACT DETAILS OF ALL COMPANIES RESPONSIBLE FOR INSTALLATION:

* Note that the design phase may involve several different parties

DESIGNER*	• Layout • Structural • Product • Rescue	
STRUCTURAL ENGINEER (Where applicable)	• Company and Name	
MANUFACTURER	• Product Specification • Installation instructions • Certification of installer	
INSTALLER	• Installation • Testing	

I certify that the details set out on this document are true and that the system has been laid out, designed, installed, certified and documented in accordance with the requirements of the Industry Code.

Signed……

Print name……Phone……Date……

INTENDED SYSTEM USE		
1	e.g. Gutter Cleaning	
2		
3		
4		

Company

F1 INSPECTION CHECKLIST – GENERAL INSPECTION CRITERIA (System Installer)

The inspection checklist below is a list of general considerations of an inspection process. This is a guide only and checklists should be based on the manufacturer's requirements, nature of the anchors involved, their location and any specific environmental conditions that may impact the performance of an anchor or system.

PROJECT AREA	ITEM	TICK / CROSS
Design	• Determine if the system layout is still suitable for the tasks for which it is being used / was originally designed	
Installation	Visually inspect for: • Corrosion • Data plate is in-tact • Number of users noted on data plate • System rating noted on data plate • Any evidence of light degradation • Any evidence of impact on an anchor or system	
Testing (if required)	• Complete static (proof load) testing if required (friction or glued-in anchors only)	
System configuration	Visually inspect for: • All system components, including PPE equipment are in-tact and still safe for use (harnesses, lifeline travellers, shock absorbers, ropes, access ladders, ladder brackets)	
Operations Manual	• Is in place and accessible by users. All components of the original manual are in-tact, including manufacturer's instructions, use requirements and inspection checklists from previous inspections	
Exclusion Zones	• Are there any areas of the structure that are not covered for access by these systems that need to be identified and reported?	

Refer to additional specific instructions for inspecting:

- Welded anchors
- Bolted anchors
- Cast in anchors
- Surface mount anchors
- Friction anchors
- Glued-in anchors
- Horizontal systems
- Vertical systems

Company

F2 INSPECTION CHECKLIST FOR A SYSTEM CERTIFIER

PROJECT AREA	ITEM	TICK OR CROSS
Design	• System layout suitable for works to be carried out? • Structural considerations (e.g. Has suitable engineering overview been applied?) • Selection of suitable products (this covers anchor, fixings, sealants, corrosion resistance etc.) • Has a viable rescue method been allowed for? • Is there safe access to and from anchor system and around works? • Are any building features over which ropes may need to pass suitable for loads or have protection allowed for (i.e. Sharp edges, glass balustrades etc.)?	
Installation	• Are works completed in a workmanlike manner? • Have fixings and anchors been installed as per manufacturer's specifications? • Have works been properly cleaned up? • Does the installation works follow the specifications and drawings?	
Testing / Commissioning / Certification	• Has all required testing been successfully undertaken? • Has all necessary remedial works resulting from testing been adequately completed? • Has all required labelling and signage been provided? • Are all serial numbers and batch numbers recorded? • Has a suitable system manual been produced?	
Documentation and handover to Workplace Manager	• Has system manual been handed to Workplace Manager? • Has documentation adequately set out maintenance and inspection requirements and listed necessary operator skills, supervision levels and any special PPE and protection methods required? • Has a formal handover with Workplace Manager been carried out? • Has the issue of operator training been adequately covered?	

Company

F3 INSPECTION CHECKLIST FOR ANCHOR SYSTEM INSPECTION – ONGOING RE-CERTIFICATION

SECTION	DETAIL	Pass or Fail
Documentation	• Is there a system manual? • Is the system manual adequately detailed? • Does the system manual set out a proposed rescue method? • Does the system manual set out inspection and test methods? • Does the system manual provide a layout of the anchor system? • Does the system manual provide serial and batch numbers of all anchors? • Does the system manual adequately show the method of use/rigging from the anchors? • Does the system manual detail the works intended to be carried out from the anchor system? • Does the system manual detail any constraints on use of anchors i.e. Capacity <15kN? • Does the system manual contain the original certifier's sign off confirming the system complies with WAHA Industry Code? • Does the system manual demonstrate how to deal with building features where additional protection may be required (e.g. Glass balustrades, sharp edges etc.)? • Does the system manual detail any special components of PPE, slings etc. that may be required for specific use of the system?	
Layout	• Is the layout of the anchor system suitable for safe use for the intended works (i.e. The works specified in the system manual)? • Is system layout suitable to avoid "voids" at corners ?	
Labelling	• Is system adequately labelled? • Have updated labels been fitted at THIS inspection to demonstrate anchors are safe for use?	
Corrosion / Substrate	• Have all anchors and substrate to which they are fitted been inspected for: ➢ Corrosion ➢ Degradation of substrate ➢ Degraded sealant • Where documentation requires it, have anchors been removed to inspect internally for corrosion?	

F3 INSPECTION CHECKLIST FOR ANCHOR SYSTEM INSPECTION – ONGOING RE-CERTIFICATION (CONTINUED)

SECTION	DETAIL	Pass or Fail
Fixings	• Have all fixings been inspected for: ➢ Corrosion ➢ Loose fixings ➢ Degraded adhesives ➢ Degraded sealant ➢ Installation to manufacturer's requirements	
Anchor Condition	• Have all anchors been inspected for: ➢ Serial / batch numbers ➢ Corrosion ➢ Loose components ➢ Distorted components ➢ Current inspection tags (if system was not "in date", this may raise questions about its overall management) • Are any devices used in protection of equipment or building features (e.g. glass balustrades) present and in useable condition?	
Testing	• Has testing as required by the system manual been carried out? • Was all testing successful (i.e. All items passed)? • Has any issues raised by the testing been remedied safely?	
General	• Are any components of PPE or items such as slings which may have been supplied for use with the system present, within date and in serviceable condition? • Is the system suitable to be re-certified and continue to be used?	

Where there is inadequate information available to satisfactorily tick above boxes, then all or some of the works may require investigation to update the works. Note that this may place the re-certifier in a position of becoming the System Designer of the system and as such, great care must be taken with re-certifying or updating existing installations.

While remedial or update works are being undertaken, the system should be tagged out of service.

F4 INSPECTION CHECKLIST FOR A WORKPLACE MANAGER - SYSTEM & ANCHOR INSTALLATIONS

PROJECT AREA	ITEM	TICK OR CROSS
Design	• A complete design and layout of the proposed system is provided in 'plan' view	
Installer Qualifications	• The installer can provide: • Verification of Insurance coverage for Public Liability, Professional indemnity and Workers Compensation insurance coverage • Evidence of manufacturer training/certification as an installer • Evidence of working at heights training	
Installation Preparation	• Engineered drawings or opinions of the system layout are suitable (if required); • Results of a calculation program verifying the loads of the system will not affect the structure of the building; • Evidence that the product selection being offered by the installer is suitable for the location/materials to which the installation is being made.	
Testing / Commissioning / Certification	• A copy of the operations manual for the system including use instructions, numbers of users, tasks for which the system can be used, inspection requirements, Installation certificates, Proof load test results and/or certificates, manufacturer endorsements	
Documentation to be kept in suitable storage location for ongoing access	• Folder with all required documentation is provided for access by the facility manager and users if required • Evidence of Hand-Over and Training provided to ensure safe use of the system	

APPENDIX G - Other Information

G1 - Frequently Asked Questions (FAQs)

Q: Can I install an anchor or lifeline system without using a structural engineer?
A: Yes, if the anchors are installed to the substrate prescribed by the manufacturer and following the installation requirements as documented, providing it's a proprietary system.

Q: If I have an anchor complying with AS/NZS 1891.4, do I have to replace it?
A: A risk assessment should be made as to whether the anchor(s) are safe to use or not. If it's not safe to use, it should be removed, irrespective of claims of compliance at a point in time. If it passes, there is no requirement to remove it.

Q: If the system installer cannot demonstrate they can comply with the requirements of this Industry Code, can the system they install be safe and compliant?
A: No. If compliance with this Industry Code is claimed then the system must be designed and installed, then certified, strictly under the requirements of this document.

Q: If anchors (new or existing) are drilled in (e.g. Friction or glued in), can they be used in axial tension (direct pull out)?
A: No. It is not recommended that anchors with fixings in tension be used in this way.

Q: If an existing system does not or is found not to comply, can it be upgraded to compliance status?
A: Yes it can. However it may require extensive engineering and upgrading works. In the end, it needs to comply as if it were a new project for it to be safe to use. Whilst making a determination, tag the system out so it can't be used and follow the requirements of this code.

Q: If a system provides no safe manner to reach the anchor points or anchor system, can it still claim compliance with this Industry Code?
A: No. A critical part of "compliance" with this Industry Code is the issue of safe access to, from and around the anchor system.

Q: If a certificate of compliance has not been issued on a new project, can compliance still be claimed and can the system be used?
A: No.

Q: If a fall protection design/installation company provides a lifeline, anchor or rope access anchor system, does this system comply with this Industry Code?
A: If the requirements of this code have been met, then it does comply and is safe for use.

Q: If the documentation for a system does not adequately address the issue of rescue, can the system still claim compliance?
A: No. Again, a suggested rescue method, including addressing the suitability of anchors being used in the rescue that may have been damaged in a fall, must be addressed as a critical component of the anchor system.

G2 - Lanyard or Fall protection device connection points

While AS/NZS 5532 is a Standard written about “single point” anchors, it is primarily the manufacturing Standard to be met. AS/NZS1891.4 is however the ‘use’ Standard and this does allow for 2 persons to be connected to a single anchor where the anchor (and the installation) is designed for this purpose. (Such anchors are designed for higher loads - they must be a minimum of 21kN - refer to AS/NZS1891.4 for further detail).

It is recommended that in all such cases there are 2 unique connection points on the anchor to clarify it is suitable for dual connection and there should not be a reliance on labelling to communicate this information given the risk it may fade, be removed or destroyed during use.

G3 - Rope Access Anchor Connection Points – 1 Point or 2?*

The following advice applies specifically to rope access operators who have 2 ropes to connect, however it should be seen as good advice also for any situation where a single anchor is rated for use by 2 persons (i.e. 21 kN ultimate)

Rope access operators are required to connect independently at all times.

However in the case of an anchorage, the load combines when the load transfers back to the structure.

1. In line with trying to ensure that all permanent anchors are suitable for ease of use by Level 1 operators, it is recommended that there should be 2 separate connection points – one for each rope – even if there is only a single anchor.
2. The overall anchor design load should be a minimum of 30kN (15kN ultimate for each anchor) as a minimum.
3. The anchor needs to be designed and installed with a strategy for any potential rescue in place.
4. The markings and user instructions need to clearly define the capacity of the anchor (necessary to ensure no connection of a second person unless rated as such).
5. The anchor needs to take into account likely directions of side loading from operator’s ropes and hardware.
6. Anchor installed for Rope Access use where hole pairs are orientated in North, South, East and West configurations – note this installation is mounted on a through roof bollard and is yet to be labelled. Only one user should attach to each anchor
7. Another anchor set up for Rope Access use with pairs of holes in each orientation allowing 360 degree use. Note this unit is “top fixed” but is fixed through to purlins and uses roof sheeting only for plan bracing. Only one user should attach to each anchor.

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G4 - General Advice for Designers of Rope Access Anchor Point Installations

Connection Points

- Keep work rope and backup rope connection points close together unless there is a reason for them to need to be apart
- Keep connection points without sharp edges, by using rounded material, chamfered holes etc.
- Set up connection points for use by karabiner or shackle – preferably do not rely on operator tying into to anchor point
- Ensure connection point will not be loaded in a way that weakens it – sometimes this may require a moveable head or design modification to achieve

Layout

- Provide more anchors and less or no diversions to keep layout simple and less chance of operator error;
- Design systems to be as simple and straightforward as possible and wherever possible, suitable for Level 1 operators – less chance of mistake and generally more economical in the long run;
- Keep rope runs away from rotating parts, areas that are difficult to rig or feed ropes through, and away from sharp edges;
- On building edges, consider installation of edge detail that will not damage rope and/or supply portable devices for rope protection (ensure they cannot drop!);
- Where glass balustrades are used, ensure rope is kept away from glass – often achieved by use of davit or steel framing with specific rope path;
- Can all members of the team reach all required anchors safely? – Glass is not load bearing (e.g. For more information on edge management, refer to IRATA International edge management poster & ICOP sections 2.7.10 and 2.11.3.2.1);
- Has long-term maintenance of the anchor system been adequately considered?
- Will the system allow access to ALL the points likely to be required by the client for maintenance purpose? This may include areas of roof, parts of façade, other structural elements on areas such as chimneys, cooling towers, cranes, gutters, façade and maintenance;
- Does the system also need to allow for powered access for heavy-duty works? (I.e. Re glazing, painting etc.) Anchors are often installed capable of being used for both purposes.

Re-Anchors (Re - belay)

- It is possible to use anchors for this application, however a high degree of care is required to ensure the anchors are installed correctly, particularly in retrofit applications. The reason for this is that it may be difficult to prevent anchors needing to be drilled in and used in axial tension.
- Use monorails in preference to individual anchors – monorails should be regularly fixed to substrate so that a failure of an individual fixing point will not render entire rail unsafe.
- Monorails should be designed to allow multiple operators and/or rescue capability

Public Protection

- The layout of the system needs to consider how public protection will be achieved. The planned manner needs to be communicated to the users clearly.
- Permanent elements may need to be supplied or installed to assist with public protection (e.g. bollards, boarding and catch nets).

Manual Handling

- A rope access site is a work place – the designer must ensure that any hardware intended for use on site by the crew can be safely handled and placed without undue strain and danger. This is likely to affect davits, counterweights, “needles” and the like. Consider how these are handled
- Heavy or bulky items are often built in broken down form to allow safe and simple carriage and placement.

Rescue

- Ensure that rescue is considered at design layout stage and document
- Consider whether an emergency response team can access the area where an injured worker is lowered to (e.g. A private balcony or inaccessible awning)

Produced by: the Working at Height Association (WAHA)

Issue: Number 1a, July 2018

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